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The Measuring of Trade Knowledge and Trade Skill

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ONE of the most fundamental causes of many changes now being brought about in our modern industrial methods and organization is the application of scientific knowledge to the various phases of industry. This applies to tangible things such as the plant, equipment, and products; and also to the more or less intangible things such as scientific wage systems, motion and time study, the work of the planning and routing departments, modern advertising and salesmanship methods. In fact, the modern industrial plant is nowadays nothing more nor less than a huge collection of scientific apparatus closely correlated. The modern manufacturer uses scientific knowledge and scientific methods in all branches of his work. He hires specialists, men who have spent years preparing themselves for their work in their special fields.

The modern factory is scientifically located at a strategical point in nicely balanced relationship to sources of raw material, market for finished product, transportation systems, access to labor markets. The building itself is an example of applied science. The structure, the materials, windows, doors, elevators, fire-protection devices, are all decided upon on the basis of scientific knowledge. The machinery and power plant are the best that money can buy. The engineers know exactly what they want and they take mighty good care to see that they get what they specify. All the machinery and the layout of the various departments are placed in conformance with a scientifically designed plan of routing to save handling the material and product. The materials used in the plant are all ordered on specifications scientifically determined. The coal must have so many B. T. U., the steel must contain so much carbon, manganese, chromium. It must not have more than a certain percentage of phosphorus or sulphur. Tests of all kinds are applied to all material bought and used. Almost every up-to-date plant has a chemical and a physical testing laboratory. It has scientifically determined standards and specifications for every bit of raw material and finished product.

When the modern manufacturer is dealing with material things, he is a scientist and places great reliance on scientific methods. But when it comes to buying and using the one element in his organization that makes all the others effective or non-effective, namely, his labor force, he is usually anything in the world but a scientist and is not always open-minded toward the use of scientific methods in handling labor. In the near future, the modern "captain of industry" will use as scientific methods in hiring, training, using, promoting, transferring, and discharging his labor as he now uses in buying and using his raw material or in marketing his finished product. The big problem that faces the modern manufacturer is in being sure that he gets his money's worth when he hires his labor force.

Types of Tests for Scientific Hiring.

Three types of tests are now available and in use for the scientific hiring and placing of men: (1) general intelligence tests; (2) aptitude tests; (3) tests for trade knowledge and trade skill. This article has to do only with the third—tests for trade knowledge and trade skill.

A very good beginning was made during the war in the development of trade tests that will be of great value to industrial executives in properly hiring their labor. In using these tests the following results may be expected in more or less degree according to conditions in the particular situation in which the tests are used and the manner in which they are developed: (1) the employer is protected against the "bluffer" and "faker" who claims skill and experience which is not justified; (2) increase in production and lowering of costs by getting the right man on the right job are ensured in the shortest possible time; (3) a more contented labor force is produced—the man who is successfully working at the job for which he is best fitted is always the contented and efficient worker; (4) decrease in labor turnover is obtained by virtue of the fact that the man is not hired until he has proved his competency, and when he does get on the job he is more certain of himself, more efficient, more likely to give satisfaction.

The U. S. Army Trade Tests.

The trade test branch of the personnel division of the United States Army during the war formulated and

standardized tests for eighty of the more important trades. By the use of these tests they were able to place a man in the particular group to which his trade knowledge and skill entitled him. The statements of the majority of men concerning their trade ability and knowledge cannot be entirely depended upon. Not that they intentionally purpose to deceive, but that they have no adequate standard to compare themselves with.

Four Classes of Workers.

For each of the eighty trades, the army established four classes of workers, depending upon the amount of skill and knowledge the worker possessed. These classes were as follows:

1. *The Novice,* a man with no trade ability, or one with so little that ordinarily he would not be considered when making trade assignments.

2. *The Apprentice,* a man with only enough trade ability to make him useful as a member of a group under supervision; a man who is not qualified to work without direction or when speed and accuracy are essential features.

3. *The Journeyman,* a man with enough trade ability to qualify him for assignment to work which must be done quickly and well.

4. *The Expert,* a man with a high degree of trade ability and judgment, qualifying him for assignments requiring superior workmanship.

These tests determine not only the actual possession of trade knowledge and trade skill, but also the degree in which they are possessed. Two hundred and fifty thousand soldiers professing to possess ability along certain trade lines were tried and tested with the following results:

30 per cent were inexperienced novices;
40 per cent were apprentices;
24 per cent were journeymen;
6 per cent were experts.

How the Tests Were Built Up.

The method of building up the trade tests was as follows:

(1) Full information about the trade was gathered from superintendents, foremen, workers, trade schools, trade unions, trade literature, etc.

(2) A tentative test embodying the essential features of the trade was prepared.

(3) This tentative test was tried out on a number of tradesmen of differing but known degrees of trade ability.

(4) The test was revised in the light of the results of this trial.

(5) The revised test was tried out on twenty men known to be experts, twenty men known to be journeymen, twenty apprentices, and twenty inexperienced novices. To avoid special local custom and trade peculiarities, the tests were tried out on men in different parts of the country.

(6) The results of these tests were then analyzed to determine which parts of the tests would the more accurately separate experts from journeymen, journeymen from apprentices, apprentices from novices.

(7) The finished trade test was then tried out on larger groups of men, and if shown to be reliable, was placed in use in the camps and cantonments.

Four Types of Trade Tests.

So as to give all types of men an equal chance, the army tests were of three kinds, as follows:

(1) *Oral Trade Tests.* These consisted of questions designed to bring out definite points of trade knowledge, to get an idea of his range of knowledge and practice, to test the accuracy and soundness of his judgment on practical problems. These were usually ten questions requiring about ten minutes to state the questions and get the answers. Each correct answer counted 4. The total score indicated the standing of the person tested.

(2) *Picture Trade Tests.* In this type of test, pictures of tools, materials, machine parts, and products of the trade were presented to the applicant and he was required to name them and indicate their special uses. There were usually about twenty pictures and twenty questions, taking about fifteen to twenty minutes to answer. Each correct answer was given a definite value and the total score indicated the standing of the person tested.

(3) *Performance Trade Tests.* In these tests an opportunity was given the applicant to actually perform some representative task with the tools, materials, and processes of his trade. In this test quality of workmanship and speed are both taken into account. The time of this test averaged about thirty minutes. Each operation was given a certain number of points. If there was a total of 50 possible points, the applicant was rated a novice if he made from 0 to 14 points; apprentice, 14 to 30 points; journeyman, 31 to 40 points; expert, 41 to 50 points.

An example of this type of test is that given to a pattern maker. The applicant makes a pattern for a cast steel bracket according to a blueprint. The pattern involves some of the essential factors of the trade, such as the angle moulding, core prints, draft, finish, filleting, etc. Any one who can make the pattern in the time allowed is judged a skilled pattern maker.

An inside electrical wireman is given a frame consisting of parts of a ceiling, joists, and cross-pieces. One side is the floor above; the other side is the plastered ceiling below. The problem is to run two feed wires thru both joists. From these main lines tap off leads in parallel and drop a lamp cord. This must be done in less than thirty minutes.

A test for steam fitters consists in making up a miter radiator coil out of its fourteen parts. If the job was not correctly done, or if it took more than two

hours, the applicant was rated as a novice. If it was done in twenty to twenty-five minutes, a rating of journeyman was given. If in eighteen minutes or less, the man was classed as an expert steam fitter.

In the test for a structural steel erector, the examiner, gave the applicant a blueprint on which was printed the following instructions: "Drill a hole for a three-quarter inch rivet in the web of this I-beam, one-half inch from the end of the beam and two inches from the top of the beam. Block or cope one side of the flange. Center of saw-cut should be directly over the center of the hole. Use hammer and chisel to finish the cope." The material consisted of a length of standard eight-inch I-beam; the tools used were a ratchet drill and two-pound ball pein hammer, two one-inch flat chisel, a heavy center punch, a two-foot rule, a twelve-inch adjustable hack saw frame, three blades (fourteen teeth to the inch), one three-fourths inch, one 13/16-inch, and one 7/8-inch Morse Taper square shank drills, one Terry Old Man wrench.

The examiner graded the significant features of the work. If the center of the hole was located correctly within 1/16 of an inch, four points were given; if 1/8 of an inch off, only two points were given; if over 1/8 of an inch off, no points were given. Four points were given for using the 13/16 inch drill; none if the 3/4 or 7/8 inch were used. Two points were deducted for every saw broken. The same system was followed with the dimensions from the top of the beam to the center of the hole, the squareness of the saw-cut, etc. Both quality and speed entered into the final score, and journeymen must score at least thirty points and finish within twenty-five minutes.

(4) *Modified Performance Trade Tests.* The above performance tests have one disadvantage when applied to industry and that is the amount of materials, tools, machinery, equipment, etc., that would have to be held out of production. In some cases this item would not amount to much, but in many others it would make the test almost impossible to give. In such cases a blueprint might be prepared and handed to the applicant and he be required to tell how he would do the job shown on the blueprint, what he would do first, second, third, etc., the tools required, and about how long it would take. In applying the tests to industrial conditions, we must keep in mind the principle of efficiency designated as "common sense," and adapt the test to the peculiar needs and conditions of the plant, department, trade, job, occupation, type of applicant, etc.

Vocational Guidance in Prevocational Schools

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A PROMISING educational development of the present day is found in the vocational guidance movement. Psychologists are contributing to it thru mental tests, schools are attacking it in their classes and placement bureaus, and individual counselors are here and there equipping offices and attempting to do business of this sort on a financial basis.

Just what form guidance in the school system will take is still problematical. Up to date it has appeared under somewhat different aspects in different parts of the country. Thus we see it appearing (a) in school talks by successful business men, (b) in vocational information and life-career classes, and (c) in private conference and follow-up care.

It is worth while to consider each of these movements separately and to see the relation each bears to the general movement. We shall probably conclude that each type will be contributory to the more stable form which will evolve as a result of them. Thus (a) leads up to and will probably be supplanted by (b), while (b) and (c) are likely to combine and supplement each other. Let us look for a moment at (a).

In the beginning of the vocational guidance movement, when school officials first began to realize the need of closer contact for children between school and work, the most obvious and practical mode of accomplishing this end seemed to be to bring business men to the school and discuss their work and so create for the children the closer contact in this way. These talks were doubtless well worth while but for the most part were unsatisfactory in their lack of coordination and in their incompleteness. This method when continued, improved and supplemented becomes itself a course in vocational guidance or a life-career class. It becomes movement B. In type (b) the vocational information or "life career class" appears a more complete and satisfactory (a) but when given alone it lacks the individual touch, the clinching of the point, the personal counselling. Method (c) gives the advantage of the individual conference but is accomplished with waste of time in that a great mass of material which must be made common to all and could be well given to a group as a whole is now repeated to each individual separately. Counselors working under either methods (b) or (c) exclusively will be likely to feel the lack of their method when taken by itself and to desire and later seek for, the combination of the group lesson and the private conference.

Assuming then that efficient school counselling requires a combination of class and private work, we next face the issue—Of what shall the subject matter for our group work consist? Recent writers on this subject have outlined a course extending thru the last grades of the elementary and thru the four years of the high school. The work as outlined by them is progressive—each year building and preparing for the years that are to come. One writer has plotted out the course

somewhat as follows: One year for the building of ideals, one year for self-analysis, one year for the choice, etc. The courses as outlined by these writers cover a large field and could not fail to be of value to the pupils studying them. The question arises, however, as to the complete adequacy of the subject matter as outlined by these writers when applied to schools of different types from those to which these courses were fitted. As arithmetic is no longer merely arithmetic but is becoming shop mathematics, trade-school mathematics, etc., the tendency for other subjects will be to vary likewise. In such a manner we shall probably find the subject matter of vocational guidance adapting itself to the particular school taught. We shall have a course adapted to prevocational schools and to trade schools, to commercial high schools and to college-preparatory high schools, etc. While there would be similarity in the general outline and purpose of these courses we should find them differing in the emphasis of detail.

The North Bennet Street Industrial School of Boston has conducted an experiment during the past year based on the following assumptions: First, counselling can best be done by combining the vocational-information classes with private vocational conferences, and, second, the subject matter of the course must be especially adapted to the classes taught. Previous work in individual counselling had already shown us the necessity of the combination of the class and private conference. Hence our experiment centered on the working out of matter suitable for this course. It is this phase that we wish to emphasize in this article—the content of the plan thus worked out. The course as we have given it is adapted for a boys' prevocational school and was tried out in one of the prevocational centers of Boston. It must be remembered that it is preparatory to and leading up to the private conference. Its purpose as we have given previously is to state to the group as a whole that material which should essentially be their own before the private conference is given.

Pupils who enter the prevocational schools in Boston have for the most part already shown sufficiently marked tendencies to cause their separation from the regular classes. It is stated that these schools are designed "for pupils who may be behind in their book work but who have skill with their hands" and "members of the upper grades who do not intend to complete a high school course but who do not expect to enter the trades." Provision is made in these schools, however, for admission to high or advanced schools by those who prove willing and fitted to enter them. As a consequence we find in the schools, boys who have decided to learn a trade, boys who expect soon to leave school and go to work, and thirdly, some who will ultimately go on to the higher schools. The most efficient guidance of such boys would evidently be that which prepared them for any of the three eventualities mentioned above as well as for the broader outlook on life which boys in any guidance course should have.

In attacking our particular problem certain points stood out clear, namely: The boys must know how to advance in their own trades, they should receive an appeal for higher education, and they should become familiar with the working conditions into which they would be plunged should they leave school at once. These points we tried to provide for in working out the course. We feel that we have given but the bare essentials here and that where feasible such supplementary work should accompany it.

The course as we have outlined below has four major divisions given as follows:

An Introductory Lesson.

Education in General and Education as a Preparation for Work.

A Vocational Survey.

General Working Conditions.

Under these divisions we have given the topic for each lesson and an explanatory note for showing its purpose.

This course was tried out in one of the Boston schools thru the courtesy of the school officials and the head of the vocational guidance department.

THE COURSE.

Introductory.

A. Importance of a thoughtful choice of the life work. This lesson was designed to show the general purpose of the course and the general scheme of its development. We emphasize the fact that many adults failed to succeed in their occupations because they had let *chance* and not thought decide the question for them.

Vocational Survey.

A. Study of the city as a whole as it falls into centers, (manufacturing, musical, commercial, etc.). Designed to give pupils a basis of comparison and a plan for further study of the city. Maps of the city were used in the development of this lesson.

B. Detailed study of the particular center in which the pupils live. Its vocational advantages and disadvantages and the most general types of work done there. The pupils themselves made the survey of this center, each taking a part to study.

C. General survey of the work done in the United States. (The nine classifications as given in the United States census were used here.) This vocational survey offers a definiteness to the field of choice. We believe that a child must be continually brought to face the interrelation of the various fields of activities in order that he may see his own field more clearly. A logical choice

can only be made after a survey of the whole field has been given. A large part of the lessons here given are planned to create this background. Such lessons also help arouse the pupils' ambition.

Education in General and as Training for Work.

A. Value on an education. This lesson was somewhat apart from the general subject of vocations. It is an appeal to the child to allow himself to develop unstintedly as far as his nature allowed. The matter was viewed from the standpoint of the value of an education to the individual pupil, to his parents, and to the nation as a whole.

B. Educational opportunities ahead of the pupil. Statistics show that pupils of the prevocational schools continuing in school are likely to go (a) to trade school or (b) to one of the high schools offering trade training among their courses. Chart B was used as an aid to the visualizing of these schools.

C. Relation of typical kinds of work to the training they require. Chart A gives illustrative material.

D. Detailed study of occupations of boys of their own age now at work, lower line, Chart A. Supplemented by detailed analysis of one of these occupations. Serves two purposes—prepares boys who must enter the field at once and shows what greater opportunites would be open to them if they could continue in school.

E. Survey of work open to high school graduates—Survey of work open to college graduates. This lesson also is for the purpose of background and was emphasized less than the field of work into which the pupils are most likely to go. For intelligent choice and progress a worker must know not only his own immediate opportunities but should have general information of the field into which his fellow workers go. This lesson was visualized by means of Chart A.

General Working Conditions.

A. Supply and demand of labor, and forces contributing to their regulation. A worker must be taught to look ahead in his trade and to watch his general condition. He must learn to observe the laws of supply and demand both as a worker and when choosing his occupation.

B. How to find a job. Discussion of newspaper advertisements, commercial agencies, etc.

Value of an Education.

A. Value of an education. In the last lessons the value of an education was once more impressed upon the pupil but this time from a general standpoint. This lesson serves as a summary of some of the lessons that go before as well as for a last appeal to further educational development.

CHART A.

Relation of School and Work.

Elementary School Leads to	Errands (Temporary) Messenger Service (Temporary) Factory Unskilled Work Work where skill is learned in trade with low educational requirements
High School Leads to..	Stores Banks Drafting Metal Work Electrical Work Accountants Bookkeepers Stock Clerks Designers Foremen Draftsmen Inspectors Business Work where skill is learned in trade but where higher education helps
College Leads to.....	Engineering Medicine Law Ministry Teaching Journalism Dentistry Architecture Work where skill is learned in trade but where advanced education helps

CHART B.

The Courses Given at Some of the Trade Schools in Boston.

Prevocational.	Continuation.	Trade School.	Cooperative Industrial High.	Mechanics Arts High.	Wentworth Institute.
Woodworking	Woodworking	Cabinetmaking	Woodworking	Woodworking	Carpentry
Printing	Printing	Carpentry	.....	.....	Printing
Electric works	Electric work	Printing	Electric work	.....	Electric wiring
Sheet metal	Sheet Metal	Electricity	Sheet metal	.....	.....
Machinery	Machinery	Sheet metal	Machine Shop	Machine Shop	Machine
Paint Shop	Paint Shop	Machine Practice	.....	.....	.....
.....	.....	.....	Pattern-making	Pattern-making	Pattern-making
.....	.....	.....	Drafting	Free hand and mechanical drawing	Advanced pattern-making and design
.....	.....	.....	Foundry Practice	Forging	Foundry practice and forging
Bookbinding	.....	.....	.....	.....	
Gardening	.....	.....	.....	.....	.....
.....	.....	.....	Boat Building	.....	.....
.....	Commercial	.....	.....	.....	.....

COLOR PRINTING FROM LINOLEUM PLATES

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PRINTING, with its preparatory work, accomplishes for the school and its community, all that the newspapers, magazines, and commercial and civic advertising accomplish for a city. Surely there can be no more efficient way of spreading education broadcast than by sending out from the school itself, thru its publications, that for which the school stands. And color printing furnishes a means of visual expression that cannot be secured by words alone. An idea can be conveyed instantly by a design. The captured attention thus functions thru interest and desire. Hence the value of commercial advertising thru decorative expression.

Color printing from linoleum blocks can be carried out in the art department alone, but the work becomes richer, not only in cooperative development, but in technical results as well, when it is carried thru the art, manual training, and printing departments. By teaching the various processes separately, under different instructors, the pupils are made to specialize for the time being in each technicality. Concentration in each phase of the work is highly desirable. Keeping the aim of our project clearly in mind, the benefits derived from cooperative departmental work are obvious. Each class develops its side of an idea for future mutual benefit. Each exercise given becomes a step toward furthering a common purpose.

Art classes develop and express the idea which is to be multiplied in the print shop. The manual training department furnishes the best conditions for the construction and cutting of plates. For this work small classes and individual instruction are necessary. After the plates are cut, the printer takes charge, and by consultation with the art instructor the colors are adjusted to the limitations of printers' ink, and defects of form and line in the plates are corrected in the manual training shop. After the final test in the printing department, the work goes to press.

Too much cannot be said in favor of the use of cut paper patterns for arrangement in design. Play of color, rythm of line and mass, can all be estimated, arranged, and rearranged if necessary—the final combination being the result of careful experimentation.

For example, in designing the cover for the Tattler, the McKinley school's magazine, each child drew a bird in outline, following a discussion of bird forms, and the color study required for the grade. This bird was cut out to serve as a pattern. A thin piece of blue paper was then folded into four thicknesses, and the bird pattern was traced on the top thickness with a sharp pencil. By cutting on this outline four blue

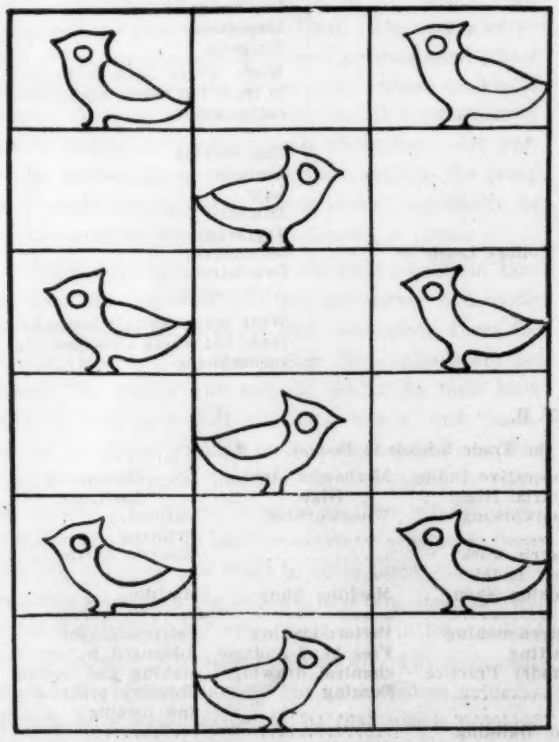


FIG. 1. BIRD UNITS TRACED IN RECTANGLES.

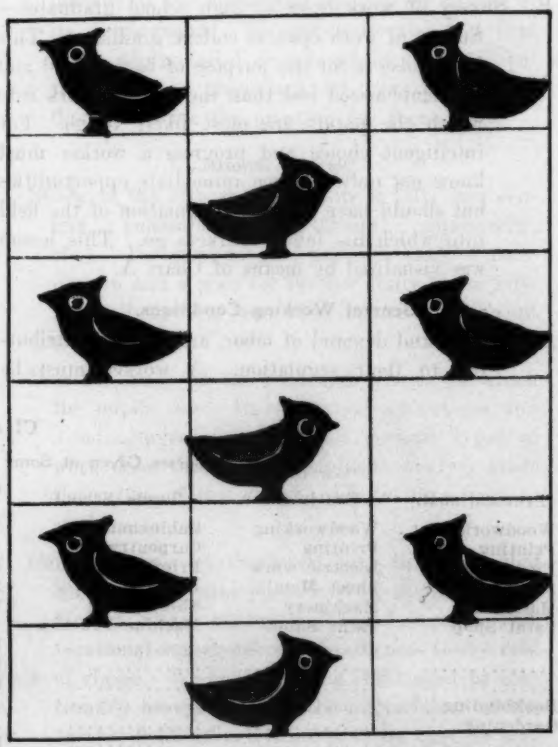


FIG. 2. BIRD UNITS PASTED IN POSITION.

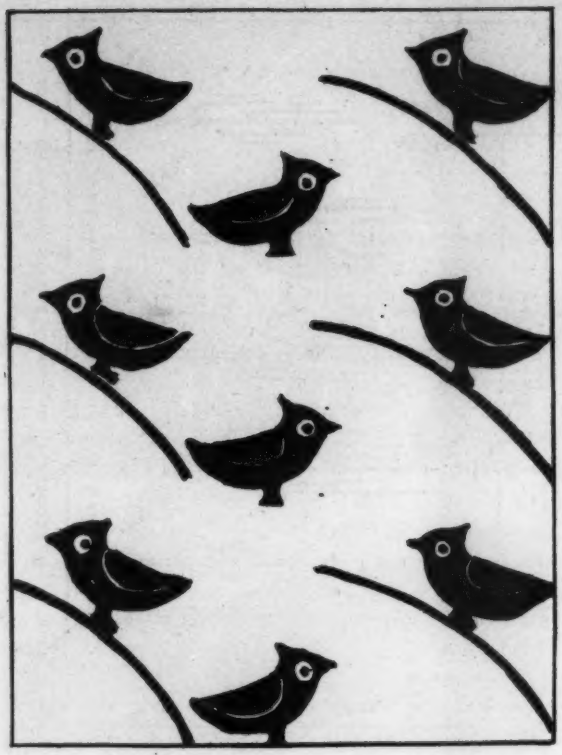


FIG. 3. STEMS TRACED AND PASTED IN POSITION.

FIG. 4. FRUIT, FLOWER AND LEAF UNITS ADDED.

birds were obtained. This was repeated a number of times until enough birds were cut to form a surface covering. A sheet of violet-gray construction paper was divided into rectangles somewhat larger than the birds. The birds were arranged in the rectangles, various placings being tried before a decision was reached as to the best one. They were then traced and placed in position. The spaces between the birds were next considered. An alternate unit seemed necessary to relieve the monotony of so many similar birds. A plant form was chosen, the directions, lengths and color of the stems to serve as perches for the birds were decided upon, patterns were cut and tried in position, a choice made, and as before the stems were traced and pasted on. The flowers, leaves and fruit were then managed in the same way.

The colored combination was a study of two sets of complementary colors, blue with orange, and violet with yellow. Green formed a link between blue and yellow.

A good design having been selected for reproduction, the pupil copied his arrangement on a linoleum block, going thru the same process with cut paper patterns reduced in scale. After the design had been outlined in pencil it was painted on the linoleum with showcard colors, lightened with opaque white, the original design being reproduced as exactly as possible.

It is necessary to have the paint lighter in color than the linoleum to clearly define the design edges. Covering the linoleum with a thin coating of white water color, and allowing it to dry before applying the design, is another method of making the design stand out. A separate plate is cut for each color, and after the test-impressions in the print shop the proofs are returned to the drawing room for comparison with the original design. Sometimes an adjustment is necessary in the design to conform to the limitations of the printing equipment and sometimes the inks must be remixed.

The landscape insert was planned in a similiar way. A landscape was decided upon to illustrate the title of an article on "Landscape Gardening." The paper itself formed the background. To shape the distant mass of trees, separate tree patterns were first outlined and then cut, after their essential formations in two dimensions had been studied. The distant group was designed by overlapping the individual trees, the whole mass was outlined by tracing, and was then cut out as a unit. Next a middle distance was planned and then the foreground. The foreground trees were designed as follows: The trunk was patterned alone, thickest at the bottom and tapering towards the top. Two directions were decided upon for the branches, outward and upward. The branches—the thicker ones at the bottom—were drawn and cut separately, and after many trial arrangements they were pasted in position. Several trees were thus designed and these, in turn, were experimented with until the best possible arrangement was achieved. Thus four kinds of patterns were made ready for use; a distant group of trees, a middle

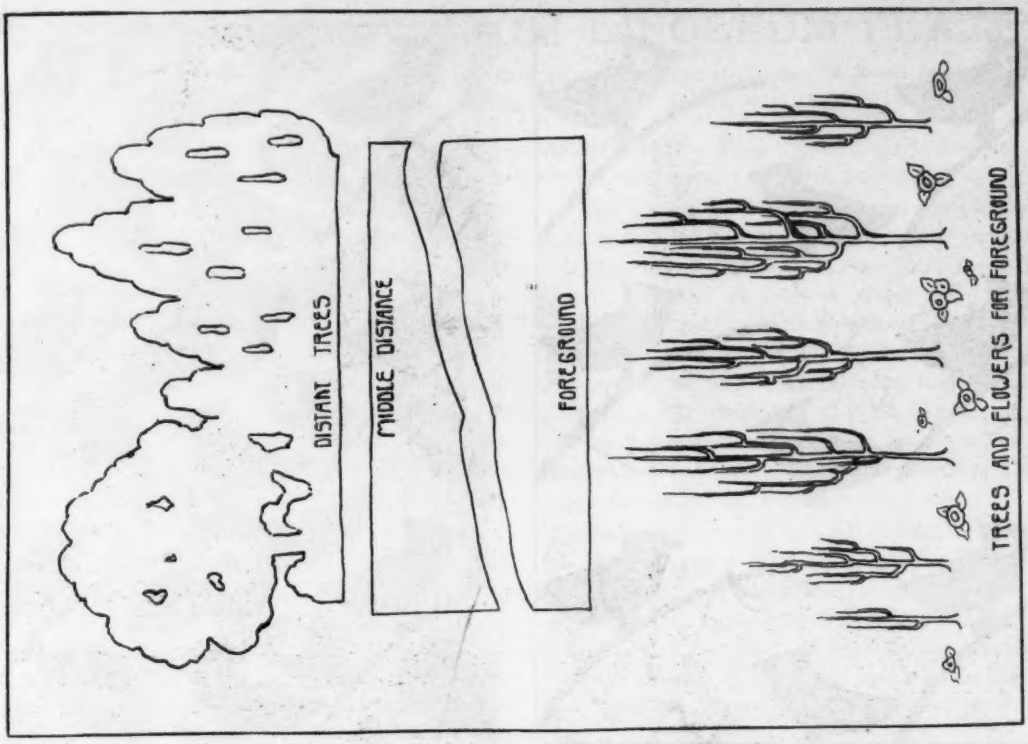


FIG. 6. DEVELOPMENT OF TREES, FOREGROUND AND TREE AND FLOWER UNITS.

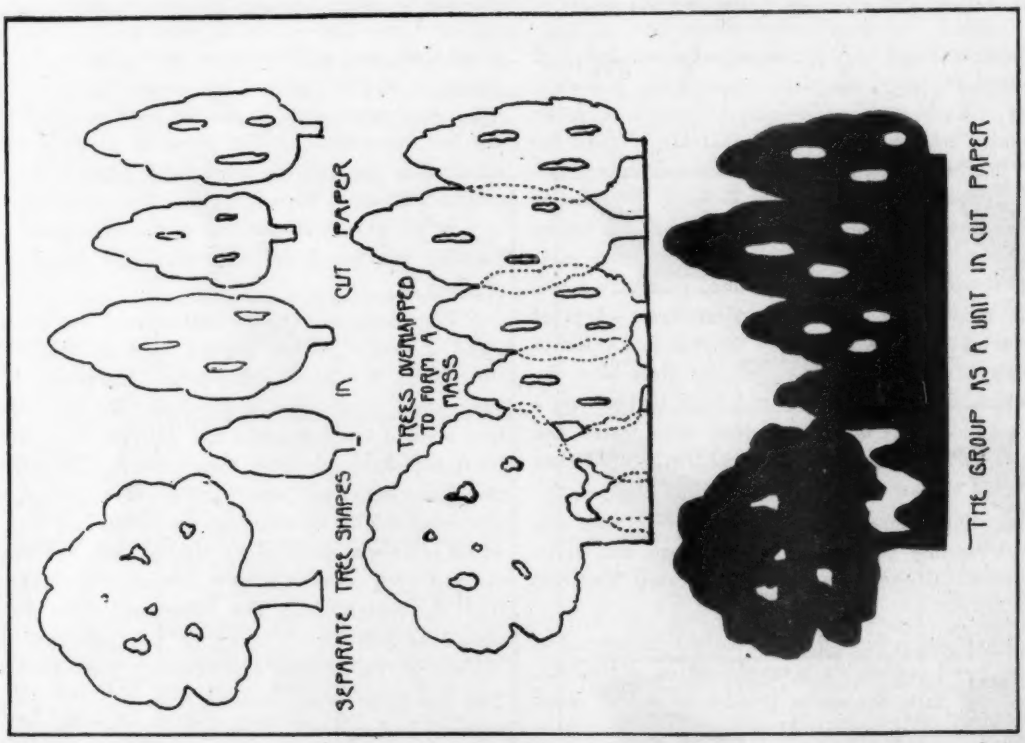


FIG. 5. DEVELOPMENT OF THE TREE GROUPS.

distance, a foreground and the foreground trees. These were assembled in correct relation to each other, and traced. Color was next considered. A complementary color scheme, with the tints and shades of one of the colors was chosen, and the traced design was filled in with showcard colors as required.

The work of the manual training shop enters the linoleum printing project when the design has been completed in the art department. The first step here is the mounting of linoleum on blocks, for the making of type high plates, which may be locked up in the press. The material used is a heavy grade battleship

FIG. 8. BACKGROUND, MIDDLE DISTANCE AND FOREGROUND TRACED AND PAINTED.

FIG. 9. FOREGROUND, TREES AND FLOWERS ADDED.

linoleum, with as hard a surface as can be obtained. The older the material, the more smoothly it can be carved. An old, well-seasoned remnant has proved most satisfactory. The linoleum is ¼ inch thick and when mounted on a ⅝ inch block, is practically type high. Any wood which has a comparatively smooth grain, and is well seasoned will be satisfactory.

The first block made for the keyplate must be large enough to hold the entire design and allow a small margin. This is sent back to the art room where the design is painted on the surface of the linoleum, as previously described. The plate is then ready to be carved.

While wood carving might ordinarily be considered too difficult for a grammar grade, the smooth, grainless, easily cut texture of linoleum, brings this form of tool work within the possibilities of the average eighth grade boy. If the pupil chosen to carve the plate, has had no previous experience it may be well to give him a practice lesson. As this form of carving is shallow, few tools are needed. Two sizes of veining tools, one fine and one about ⅛ inch wide, a medium V, and a ⅜ inch gouge are all that are necessary.

In the keyplate all the design is left, and all the background is cut away. The depth of a cut depends on the intricacy of the design, and the amount of background. The larger the spaces around the design, the deeper must be the cut, to avoid smutting the paper in printing. Probably the easiest method in carving a plate is to outline the whole design with the small veining tool, then follow with a wider tool, where space will permit. When the color areas in the design adjoin, separate them by as fine a linecut as possible, using the small veining tool for that purpose. The more accurately this is done, the better will be the register when printed.

The linoleum blocks for each color are prepared the same as the keyplate, except that they need only be large enough to contain one color in the design. These with the keyplate are now sent to the printing department, where the design is transferred from the keyplate to the individual color blocks. When this is done the separate color plates may be carved by cutting away everything in each plate excepting one of the colors of the design.

The keyplate may be cut down to one color, and used again in the printing, thus saving considerable work.

However careful a boy may be, he is sometimes likely to make a slip with the gouge, or some mistake in the cutting. When this happens it is not necessary to discard the plate, for a piece of linoleum may be cut out and a patch set in without injuring the impression. It is well not to cut the plates too long before they are to be used, for altho both the wood in the block and the linoleum are well seasoned they are likely to vary slightly in size under varied atmospheric conditions.

The work is now ready for the printer. The press is inked, and the plate locked up in the center of a

chase. It is then placed on the press and made ready in the same manner as any other type form.

The negative character of type forms is well known. The same character must necessarily apply to the linoleum plate. Therefore, in order to avoid making an extra plate, the transfers are made in an indirect way, sometimes called the offset process. To accomplish this, select several sheets of cardboard, one or two points in thickness, and at least an inch larger than the plate from which the transfers are to be made. After striking an impression on the top sheet of the tympan, adjust the gauge pins, so that the plate will print in the center of these sheets of cardboard. Enough black ink should then be added and distributed on the rollers to give a heavy black impression. The latter is important because the cardboard used may have a tendency to absorb the ink before the transfers can be made back to the linoleum again.

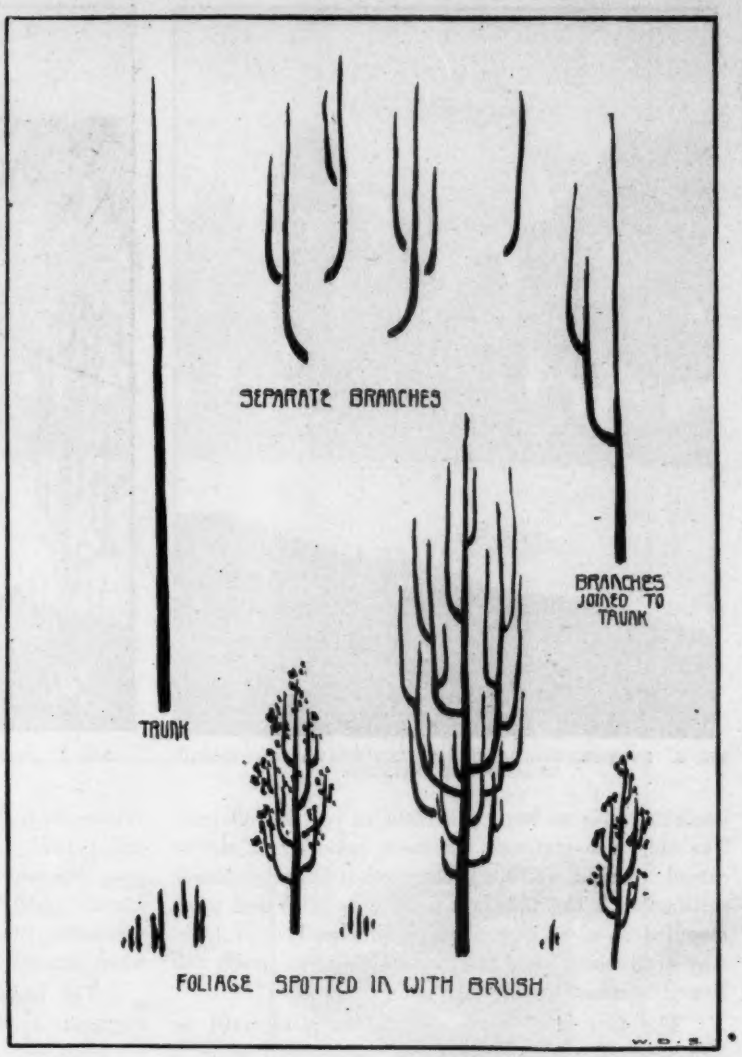


FIG. 7. DETAILS OF TREES.

After striking off as many impressions on the cardboard as you intend to make color plates, remove the chase from the press, and in place of the keyplate insert one of the blank linoleum blocks, which have been previously mounted. Care should be taken to place the bank plate in the exact position which the keyplate occupied. Lock up the form, remove the rollers from the press and replace the form in the machine. Add the thickness of one cardboard to the impression immediately underneath the top sheet of tympan to provide a trifle more resistance, and then feed one of the sheets of cardboard, on which the impression of the design has been taken, face up, into the press, and without shifting the guides run the press slowly to the point of contact. When the roller saddles are at their highest point, let the press remain in this position for a few seconds, to obtain a firm and uniform pressure. Upon releasing the pressure, it will be found that a complete transfer of design in the negative has been effected from the printed sheet to the linoleum plate.

This process should be repeated for each of the colors to be represented in the finished product. A new block, and another printed sheet, from which the ink has not been blotted in the transfer, should be used for each plate, otherwise the outline of the design and the color divisions will be too hazy to follow in cutting the various color plates. These plates are then sent to the manual training department for cutting, after which they are again returned to the printer for trial impression and register.

The process of printing from linoleum is the same as that followed in printing from any other type form. Great care, however, should be taken in making ready, as too much impression will produce a squashy effect, and also have a tendency to print part of the background, especially where there are large white spaces and alongside the fine lines in the design.

The field of color printing is not confined to illustrations. Textiles, thin wood, in fact any smooth material that can conveniently be fitted into the press, may be decorated by the means of linoleum plates, and their possibilities have not by any means been exhausted.

An Example of Efficient Vocational Education

Richard M. Van Gaasbeek, School of Science and Technology, Pratt Institute Brooklyn, N. Y.

EARLY in the summer of 1917, in consequence of the placing of large orders for "submarine chasers" and many smaller craft, a serious shortage of men in the boatbuilding industry suddenly developed.

Just at this time many building operations thruout the country were declared non-essential, causing a slump in the building trades and throwing out of employment large numbers of house carpenters and other woodworkers, who naturally turned toward boatbuilding as the kind of employment nearest in line with their experience. These mechanics, however, lacked specialized knowledge of boatbuilding, without which they were not as acceptable to boatbuilding concerns as they otherwise would have been.

Thus, on the one hand an essential war industry was seriously handicapped for want of skilled mechanics and, on the other hand, an army of mechanics needed assistance in transferring from one occupation to another. The situation offered an opportunity for the School of Science and Technology to be of service by aiding in supplying the extraordinary demands for skilled boatbuilders, not only by training woodworkers to become efficient boat shop workers, but also by helping men already in the boatbuilding industry to qualify for more advanced positions and greater responsibilities.

Pratt Institute early realized its opportunity and undertook to meet this new training problem. The writer spent the greater part of the summer of 1917, surveying the local situation, studying the skilled labor needs of the various boatbuilding shops, seeking their advice and cooperation in determining upon an outline of instruction and the preparation of an effective program for developing boatbuilders, and at the same time arousing the interest of some of the workers that they might realize the value of the opportunities offered and be ready and glad to take advantage of them. This survey gave evidence that employers were realizing more and more the need for vocational-training classes to reduce the cost of production and to maintain a sufficient supply of trained men to meet their needs. On the whole the employers were glad of the privilege to cooperate.

Figure 1—Mould loft work compared with the foreman's layout in carpenter work. A full size drawing of the vessel in plan and elevation is required in order to determine the exact dimensions of the most important parts of the structure.

Figure 2—Scarphing timbers with an adze. It's not as easy as it looks. Students become quite expert with little practice.

Analysis of the requirements indicated that the needs were for specialized instruction over a limited range. It was an emergency situation that called for quick results. It was pioneer work for which there were no precedents to go by in solving many of the problems. In planning for the organization of these new vocational training classes, among other items the plan of training required that the instructors be selected men secured from the industry, that the instruction should be practical and meet trade requirements, and that the instruction material should be organized into an effective order before presentation. In organizing the instruction material, it was intended to determine first, the best way to do the work and second to convey to the student in the shortest time possible information of how to do the work and third, to present the subject in such a way that the principles of the trade would be easily mastered by the average mechanic and more important still, easily retained and longest remembered, and finally to spare no efforts to secure the cooperation and interest of all concerned.

Having determined upon the method of solution of the problem, secured the instructors and outlined the instruction, classes were organized September 6, 1917, with a charter enrollment of 39 students, and there-

Figure 2—The complete hull. A mechanical eye will save a great deal of labor, for much depends upon the fairing in of the lines, as considerable damage may be done to a good design by deviating from the drawing.

after reorganized at the beginning of each succeeding term at which time a new group of students was admitted.

Specializing on hull construction, the course of study has been broad in its application, beginning with the laying down of the lines on the mould loft floor (figure 1) to the completed hull (figure 2) involving a study of various methods of picking up lines from the mould loft floor, making the moulds or templates used in laying out the different parts of the structure, diagonal lines, steam bending, frame construction and beveling frames, running ribbands and fairing up, scaling, spiling and beveling planking, erecting, calking, finishing, boat and ship terminology, etc. Briefly the purpose has been to qualify a mechanic to step in at any point in the construction of a vessel and give a good account of himself. Practice was given in all the operations with the emphasis placed upon a study of the principles involved.

A course in calking gave the men an opportunity to practice on a special form, after a brief explanation of the principles involved in the subject and so acquire some experience and speed to qualify them in a short time for similar positions in the industry.

A course in adzing (figure 3) taught the men how to layout scarphs and fit them with an adze, many of the students becoming quite expert with the tool, altho they had used it for the first time in the school shop.

The courses have been fundamental in character and men interested in either boatbuilding or shipbuilding have found them well adapted to their particular needs.

Boat shops and shipyards advised, encouraged and assisted in many ways. Upon request they released students from compulsory overtime without prejudice to their jobs and likewise released instructors on school nights without prejudice to their positions in order that the period of training of the students would not be interrupted or the instruction broken due to change in the teaching staff. They brought the courses to the attention of their employees and encouraged them to take advantage of the opportunities offered. They promoted graduates of the classes to more responsible positions and at times gave preference in the employment of new men, to men who were graduates of these classes.

Trade organizations posted notices upon the bulletin boards in their meeting rooms and distributed others among their membership calling attention to the entrance dates of new classes as they were about to be organized. The unions granted teachers the privilege on several occasions to be personally represented at meetings of their district councils, thus giving an opportunity to lay the work before some of their leaders, explaining to them a program and asking their support in making it effective so that they would use their influence for the best interest of all. They published many of the class problems in their trade paper. They released their members from compulsory attendance at special meetings in order that they could continue their period of training uninterrupted and on several occasions remitted fines that had been imposed for such non-attendance, thus realizing the value and importance of the work and the need for self-improvement of their members.

Summarizing results, the success of the courses have been largely due to the fact that the classes had a definite training program, that the school was concerned with increasing the skill and knowledge of those already in the industry and also with the preparation of new workers for advantageous entrance into the industry. That the program was outlined after a careful study of the trade and with the assistance of men in the trade, the problems were practical and met trade requirements, the instructors were selected men from the industry and we were able to secure all the cooperation desired. It was a course that commanded the support of employer, employee and organization alike,

Figure 4—A practical problem in roofframing. A study of the steel square, plan reading, drawing, geometrical problems. An important study that helps mechanics to solve many irregular problems encountered in their daily work.

being organized in the common interests of all to meet an urgent need and demand for this particular kind of training.

We, now (1920), withdraw these courses and concern ourselves with the new requirements of the present day. The lean years of building during the war, when building except to meet the government's necessities was prohibited has reversed the situation previously described. The past three years' cessation has created a present-day shortage and abnormal conditions and again an industry is seriously handicapped because of the need for skilled mechanics. These same carpenters who in 1917 needed assistance in transfering from one occupation to another, likewise need help as they return to their prewar activities. The problem is not so much the training of new recruits, but rather to help those with limited knowledge and experience to become better mechanics and by raising the standards of performance to tend to place the industry on a higher plane.

Carpentry or the cutting, framing and joining of timber in the construction of buildings is not merely a job. It is an art that requires an understanding of certain fundamental principles and their application. To be efficient a mechanic should be in possession of a working knowledge of these principles so that he can the more intelligently ply his trade and be up-to-date relative to the best trade practices.

Here again opportunity presents itself for the school to be of service to these same men by designing courses of instruction that will aid them in acquiring some of these principles.

Analysis of the present situation indicates that short intensive courses will best serve the needs of the workers in helping them to master some of the trade processes necessary to their advancement. Outlining a similar program as that considered and successfully applied in the training of boatbuilders, Pratt Institute organized two unit courses for carpenters during the past year: A course in roofframing (figure 4) and a course in stairbuilding (figure 5). The course in roofframing is not primarily intended to train roofframing specialists for the study is broader in its application than that. It is a study of the steel square and its uses, a most important tool in the hands of men that know how to use it and the one that will help them solve almost any difficult problem encountered in plying their trade. The course develops plan reading and teaches the men how to read and understand the language of the trade. It teaches them to think thru their job and develops initiative. Dealing with such topics as hoppers and splayed work, circular work, angles and bevels, rake and level moldings, the men are taught how to apply simple fundamental principles and thereby escape complicated geometrical diagrams in solving their trade problems.

Figure 5—A practical problem in stairbuilding. Practicing the theories of the trade. Proportioning of treads and risers, line of travel, allowance for headroom, etc.

Practice is given in all the operations from laying out to the erecting of complete model roofs such as hip-and-valley roofs of equal and unequal pitches, conic, curved-rafter, gambrel-roofs, sloping ridges, octagon and hexagonal roofs, etc. Simple methods which can be understood and mastered by the average mechanic are used for obtaining the lengths of the various rafters and necessary bevels and the backing and dropping of the hip rafters, and only such matters are presented as are of practical value to mechanics in their daily work.

The course in stairbuilding is advanced work. It is designed to give such training as will insure a thoro knowledge of the art. The study deals with all problems from allowance for headroom to the laying out and assembling of a complete stairway. The subject involves a study of the line of travel, proportioning of treads and risers, use of pitch board and templates, development of winders and strings, laying out and

construction of newels, bull nose and curved steps, curved risers, kerfing, etc.

Both of the subjects are interesting and fascinating studies that appeal to the more ambitious mechanics. During the season just closed the registration for these courses has been double the limit of the accommodations. We face the future encouraged and will watch with interest the changing conditions surrounding the local industry and as new groups and new needs appear, the course will be revised and new courses organized to meet these needs.

COLOR HARMONIES IN FLOWER ARRANGEMENTS

Bonnie E. Snow and Ella L. Langenberg

A HOUSE and a garden! To the fortunate possessor thereof, what endless opportunities are open for the exercise of decorative design! Every room,—nay, each wall in every room,—becomes a problem in the arangement of shapes. Doors and windows, when placed with due regard to structural harmony, are decorative elements, and suggest to us a great variety of treatment. The disposition of furniture will tax our understanding of the principle of balance, in the effort to attain an effect of equilibrium and repose. Rugs and hangings we shall choose, not for their individual beauty, but as members of an artistic and harmonious family of factors, each willing to subordinate itself to the well-being of the whole. The house thus becomes an expression of the station which has been reached in the artistic journey of its occupants. The house is a problem in design which is never finished, which always suggests modifications and improvements and which grows more interesting as it reflects the growth and development of the family tastes. Our houses show us as we *are!*

"I like a house of my own," said a householder recently, "because I can do anything I please with it. I can add a porch, build on a room, put in a window, improve the lighting and heating facilities, change the paint and wallpaper or make any other changes to suit myself. There is a sense of permanence and ownership in living in my own house which I do not feel when I am occupying an apartment or renting a house that belongs to another."

Flowers from the garden are the bright accents that "dress" a room, and add a touch of freshness to any decorative scheme. When, in the celebration of some especial occasion, we wish our houses to appear particularly inviting, we bring in flowers. The humblest home may be made festive by the use of flowers. The richest mansion is cold and desolate without them.

Says a writer: "Can we conceive what humanity would be, if it did not know the flowers? If these did not exist, if they had all been hidden from our gaze, as are probably a thousand no less fairy sights that are all around us, but invisible to our eyes, would our character, our faculties, our sense of the beautiful, our aptitude for happiness, be quite the same? How grave, austere, almost sad, would be the education of our eye, without the softness which the flowers give. Suppose for a moment that our globe knew them not. The infinite world of colors would have been but incompletely revealed to us. The miraculous harmonies of light at play, ceaselessly inventing new gaieties, reveling in itself, would be unknown to us; for the flowers first broke up the prism, and made the most subtle portion of our sight.'

On the school program, any branch of instruction that is closely related to life interests, and which immediately functions in the solution of home problems, is justified. The schools can do no finer work than to point the way to more beautiful living. In the effort to improve the home of the average American citizen, there is open to us no more practical and delightful means than the study of color harmonies,—not merely thru the "scaling" of colors by use of paint, or the recording of colors found in Japanese prints or in old textiles, but by working with colors as they appear in flowers, wools, silks, cottons and any other commodities or materials which we daily see and use.

At this time of the year, the children are bringing "bouquets" to school. Many a flowery tribute is shyly proffered to "teacher," in the hope that it may find a place of honor on that altar of the priestess—the teacher's desk. Shall teacher thrust the tribute into the first receptacle that comes to hand—a commonplace pitcher, a mason jar or an empty tin can? Or shall this and other tributes, gathered from garden and from wayside, be made the means by which she can "put across" some fruitful message of color harmonies?

We can imagine the preliminary conversation, held in a seventh or eighth grade: "Children, here are flowers of many kinds and colors,—sweet peas, nasturtiums, salvia, calliopsis, goldenrod, asters, hollyhocks, marigolds, dahlias, calendulas, cosmos, zinnias, daisies and chrysanthemums. Here we see the most beautiful colors in the world. We have been studying our color chart, and we have learned about several combinations of colors that are beautiful. We know what is meant by self-tones of color, or monochromatic harmonies; and by harmonies of contrast, or complementary harmonies. These flowers suggest to us another kind of harmony which we have called "analogous." In the chart (see Fig. 1) we see the colors so arranged as to make it easy to select the colors that are analogous, or similiar. Starting with yellow and working toward the left, we find three colors that bear a close resemblance to each other, yet are not the same. They are like brothers and

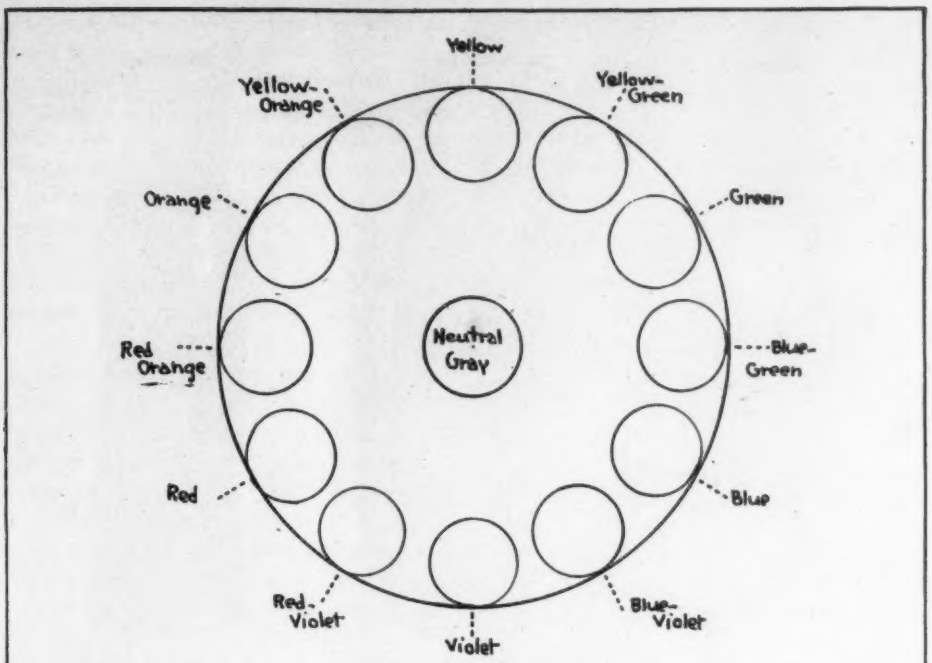


Fig I
COLOR HARMONIES

Monochromatic Harmonies
(Self Tones)

ⓐ Tint of Yellow (light yellow), Normal Yellow (full color), Shade of Yellow (dark Yellow).

ⓑ Tint of Green (light green), Normal Green (full color), Shade of Green (dark Green).

ⓒ Tint of Violet (light violet), Normal Violet (full color), Shade of Violet (dark Violet).

All colors of the chart can be treated in the same manner. Grayed colors may be used in monochromatic harmonies.

Complementary Harmonies
(contrasting colors)

ⓐ Yellow and Violet.
ⓑ Yellow-Green and Red-Violet.
ⓒ Green and Red.
ⓓ Blue-Green and Red-Orange.
ⓔ Blue and Orange
ⓕ Blue-Violet and Yellow-Orange.

Tints, Normal, Shades, and Grayed Colors may be used in complementary harmonies.

Analogous Harmonies
(Related or Neighboring Colors)

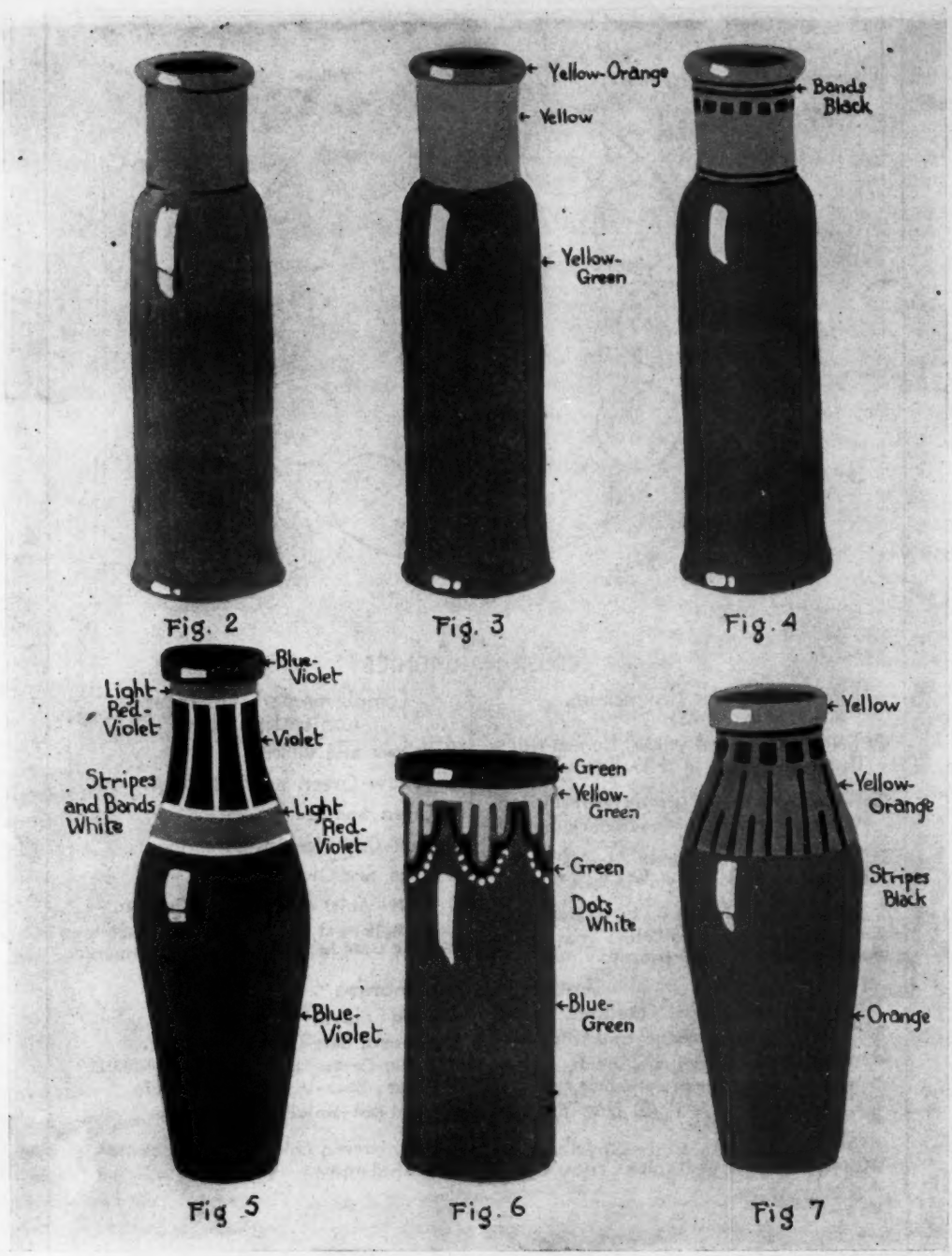
ⓐ Orange, Yellow-Orange, and Yellow.
ⓑ Yellow, Yellow-Green, and Green.
ⓒ Yellow-Green, Green, and Blue-Green.
ⓓ Green, Blue-Green, and Blue.
ⓔ Blue-Green, Blue, and Blue-Violet.
ⓕ Blue, Blue-Violet, and Violet.
ⓖ Blue-Violet, Violet, and Red-Violet.

Analogous colors are any three or four neighboring colors. Tints, normal, shades, and grayed colors may be used in analogous harmonies.

COLOR CHART FOR FLOWER ARRANGEMENT.

sisters in a family, having similar characteristics, resembling each other, but still differing enough to be easily distinguished. What are these three colors? (Yellow, yellow-orange and orange.) What flowers are here that show these same color analogies? (Nasturtiums, calendulas, marigolds, etc.) Nasturtiums, especially, clearly show this passage from pale yellow to orange. They go even further in their color range, sometimes showing colors so deep and rich that they may be classed as red-orange, in normal tones and in shades.

Let us find another group of analogous colors, beginning this time with red-orange and working down to red and red-violet. What flowers show these analogies? (Dahlias, and some zinnias in tints of these colors.) Dahlias are most gorgeous in their rich tones of red-orange, red and red-violet. We may select another group of analogous colors,—one in which we can find the colors of these lovely asters. (Red-violet, violet and blue-violet.) In the wild aster we find a deep, intense blue, which carries the analogies of the garden asters one step further. Sweet peas also show



SUGGESTIONS FOR DECORATING VASES.

us in palest tints analogies of red, red-violet and violet. So do hollyhocks, larkspurs and many more of our garden flowers. You see that it is possible for us to select any flower that blooms and place it in its family group of colors.

The foliage of plants often presents most interesting color analogies, as for example the cabbage, which shows us lovely blue-green, green and yellow-green leaves. Truly the world of flowers and plants offers us most interesting and beautiful materials for the analysis of color harmonies.

Our teacher probably is embarrassed by the lack of available receptacles for flowers. Again she makes a virtue of necessity and plans a lesson which shall function in response to her need, and at the same time serve an educational purpose. The children (in eighth grade) are asked to bring from home empty olive bottles or other glass containers which are shapely and of fine proportions. A conversation follows on the standards which should be set in selecting these various containers for use as flower holders. There should be a certain refinement in proportion and a subtle elegance

of contour. These qualities are not found in a mason jar, for instance, in a beer or soda bottle, in an ordinary jam jar or in a jelly glass. Discriminating judgment is best developed thru showing undesirable shapes in contrast with such containers as are illustrated on page 394. Here an olive bottle (Figs. 2, 3 and 4), a bottle which formerly held Maraschino cherries, a container of canned beans (imported from France) and a bottle which held salad dressing (Figs. 5, 6 and 7) are all examples of glass containers having good proportions, and suggesting a proper basis for decorative treatment.

The first step in the transformation of the container is the application of a coat of varnish or shellac, laid with a brush directly on the outside of the bottle. This coat is allowed to dry thoroly. The desired scheme of color analogies is next selected. Different members of the class, or different groups, may work on different analogies so that when the bottles are painted a number of different effects will result. There should be analogies in which yellow is the dominating factor, for the calendulas and marigolds; analogies in which violet is the dominating factor for the asters and delphiniums; analogies in which blue is the dominating factor for the gentians and cornflowers; analogies in which green is the dominating factor for any flower whose color supplements green in attaining a full color harmony.

Figs. 2, 3 and 4 show the same bottle at three different stages. Fig. 2 shows the underlying coat of shellac. Fig. 3 shows enamel paint applied in three different colors to three different parts of the bottle. An analogy of yellow-green, yellow and yellow-orange was chosen for use with calliopsis, calendulas or marigolds. The body of the bottle was painted first in yellow-green, about "normal" in value. The neck was painted yellow and the collar or rim was painted yellow-orange. These colors were all applied at one lesson, leaving a narrow line of unpainted glass between the colors (Fig. 3). The next day the paint had dried sufficiently to permit the addition of black bands of paint to cover the unpainted spaces. A simple border of black squares was added to the neck of the bottle as shown in Fig. 4. This additional decoration may easily be omitted if the difficulty seems too great. The bottle is complete without it. In fact the painting of many different analogies in these simple schemes is quite enough for eighth grade pupils.

The climax of interest is reached when, after the containers are painted, and a second coat of shellac or varnish has been applied and dried, each pupil is required to select the flowers most harmonious with his container. Surely no study of color harmonies thru the medium of paper and paint was ever crowned with such distinguished success!

Fig. 5 shows a vase-shaped bottle painted in an analogy of violet, red-violet and blue-violet. Light tints of one of the colors gave the desired contrast of

FIG. 8. A SUGGESTIVE ARRANGEMENT OF CALENDULAS.

dark and light. An arrangement of asters would complete this color harmony. Fig. 6 presents an analogy of yellow-green, green and blue-green, with small elements of white. Such a container might well be used either for blue or yellow flowers or for flowers showing in their coloring the opposite of this green analogy,—red, as in salvia. Fig. 7 shows a bottle painted in a still different analogy,—yellow, yellow-orange and orange, with black stripes. In this container an arrangement of marigolds or calendulas would present a striking decoration when used in a brown, green or blue room.

Fig. 8 shows an arrangement of calendulas in their gorgeous tints of yellow and orange with yellow-green

leaves. The container is painted in an analogy of yellow-green, yellow and orange, with black bands and collar, and with a border of white circles at the base.

Enamel paints, which are made by mixing varnish with ordinary oil paint, must be used in painting these glass containers. One coat of paint must be allowed to dry thoroly before another is applied, or before any design shapes are added. Generally, one coat of paint is sufficient to cover the glass. When the paint is thin, however, a second coat must be added. A finishing coat of shellac or varnish will prolong the durability and service of the container. Bottles thus treated resemble highly decorative pottery, painted in bright colors and glazed thru firing.

A COURSE IN AUTOMOBILE CONSTRUCTION, OPERATION AND REPAIR—II

Harry W. Anderson, Director, Automobile Department, U. S. Army Vocational School, Fort Sill, Okla.

The length of time given to the course will necessarily vary according to the attitude toward such a course, whether it is to be a shopwork course in high school or a trade course, extent of equipment, etc. The commercial automobile schools figure on two months or more, giving all the time to this work. Army vocational schools average one year of forty weeks, and trade courses in vocational schools two years. The longer the time allotted to the course the more thoro the ground will be covered. The outlines of theory and shopwork here given are the result of watching the best practice over a period of several years. The chassis is the foundation of the car and as such deserves first place in a course similarly as a course in building construction would begin with a study of the foundation and not with interior trim. A glance at the outline will show that it is composed of five major divisions; chassis, engines, auxiliaries, operation and machine shop.

Course of Study, Etc.

For arranging tests, War Training Bulletins No. 7 and No. 10, issued by the Federal Board for Vocational Education will be found helpful. The instructor might also obtain instruction Manual No. 2, issued by the Committee on Education and Special Training during the war. It might also be possible to obtain material from some ex-army instructor.

The selection of a text will depend on the funds available. There are three books at the present time which are primarily for use as texts: "The Gasoline Automobile" by Hobbs and Elliott, "The Automobile Instructor" by Clyde H. Pratt, and "Motor Vehicles" by Fraser and Jones. These books are the products of men who understand thoroly the needs of automobile instruction. The Hobbs and Elliott is the most complete and considerably more expensive. A text is as necessary in this work as in high school physics, chemistry or any other subject. To supplement the textbook reading there are many good booklets and service bulletins issued by manufacturers. These can be obtained gratis, in quantities, so that the instructors will be able to furnish each boy with quite a library of such literature.

Facilities of a shop library of motor magazines and reference books will be eagerly welcomed by the boys. The more thoro understanding and enjoyment of the subject resulting from this source will soon prove its value. The boys will be enabled to follow the changes in motor car design and to apply their knowledge to interpreting the latest motor car developments. By the end of the school year the magazines will be worn out, so eager are boys for this fascinating reading. A "Nick Carter" or "Old King Brady" never was in it with a motor magazine in the hands of a boy.

AUTOMOBILE REPAIR SHOP, BOYS' VOCATIONAL SCHOOL, ERIE, PA.

Outline of a Course in Automobile Construction, Operation and Repair

COURSE OF STUDY.	Points to Stress and Suggestions. Notes on Course.	Suggestions for Charts, Illustrations and Other Teaching Aids.
Frame. *Pressed Steel Types.* 1. Common type—kick up at rear. 2. Frame for semi-elliptic spring. 3. Underslung. Subframes, bracing and gussets. Channel steel frame (rigid).	Pressed steel frames: used mainly on passenger cars, framed narrow at front to permit turning in short radius, type coming into general use, straight side members, frame narrow in front, wider in rear. Frame with kickup at rear for semi-elliptic springs. Mounting of three-quarter elliptic springs. Materials and manufacture. Channel steel frame: used mainly on trucks. Laminated wood frames used on Franklin and Holmes. Relative strength. Brush rigid type frame used on Marmon and Lexington, etc.	Paste pictures of various kinds of frames on a piece of cardboard, labeling each kind. Build up section of laminated frame like Franklin.
Front Axle. Elliott Type—Reversed Elliott. Lemoine Type—Inverted Lemoine. Construction: I-beam, tubular, tie rod. Steering knuckles and spindles, drag link, camber, foregather. Methods of lining up, lubrication, caster effect.	The why of camber—Necessity of caster effect—Foregather, why and how much? Name cars using each type of front axle. Tubular: Franklin, Holmes. I-Beam: 1. Elliott type: Hudson, Cadillac, Liberty, etc. 2. Reversed Elliott: Oakland, Packard, Pierce-Arrow, Willys-Knight, etc. 3. Lemoine: (practically extinct in this country). 4. Inverted Lemoine: Marmon, Templar, etc. Methods of securing king bolt. Use of bearings on spindle and king bolt.	Camber—Ia. State College Teachers' Outline, Fig. 3-4. Foregather—Teachers' Outline, Figs. 3-23, 3-24. Caster effect—Timken Primer, p. 33; Teachers' Outline, Figs. 3-6, 3-7, 3-8. Type of axles—Engelman's Autocraft, pp. 175-180.
Springs. Types: Quarter elliptic, simple cantilever, half elliptic, three-quarter elliptic, full elliptic, platform, double transverse semi-elliptic, full cantilever. Spring knuckles. Spring clips. Snubbers and shock absorbers. Spring lubrication. New patented spring with roller bearings between leaves.	Types of springs, relative advantages. Types used on various cars: Semi-elliptic, front: practically all cars except Franklin and Holmes which use full elliptic. Also note that Chevrolet and Saxon use a simple cantilever. Semi-elliptic: Liberty, National, Willys-Knight, Hudson, Maxwell, etc. Three-quarter elliptic: Dodge, Velie, Old Studebaker, etc. Full elliptic: Franklin, Holmes. Full cantilever: Buick, Mitchell, Old National, etc. Double cantilever: Austin. Semi or simple cantilever: Chevrolet, Old Saxon. Transverse semi-elliptic: Ford, Old Hupp (on rear). Compound transverse semi-elliptic: Marmon, New Saxon. Platform: Cadillac, Peerless, trucks, etc. Triplex type: New Overland Four. Materials and manufacture, relative advantages of each type. Why springs need lubrication. Emphasize spring breakage causes.	Types of springs and Hotchkiss drive—Motor Magazine, January, 1920, p. 97. Hobbs and Elliott, pp. 351-354.
Rear Axle. Classes: Live and dead, plain live, semi-floating, seven-eighths floating, full floating, differential types. Function of differential. *Bearings*, roller, ball and plain. *Gears:* Straight, bevel, helical bevel, worm gear. Housing. Materials, form and manufacture. Method of fastening to spring. Torque tube, torque arm, radius rod. Strut rods, hound rods. Dead axle, double chain drive, internal gear drive.	Emphasize function of axle and shaft. Full-floating; axle shaft drives, drives, drive housing carries the load and holds wheels in alignment, overcomes side strain. Three-quarter floating: axle shaft drives and drives and takes side strain. Housing carries load. One bearing in hub. Semi-floating: axle shaft carries the load, takes side strain and drives. Wheels keyed to axle shaft. Method of securing inner end of axle shaft. Simple divided line: Ford type. Differential supported by axle shaft instead of resting in bearings.	*Types of rear axles*, Timken Primer, pp. 44-45-51. Hobbs and Elliott, pp. 392-398. Teacher's outline, Figs. 5-6, 5-18. Graph, Motor, Jan., 1920, p. 64. *Hotchkiss Drive*, Hobbs and Elliott, pp. 386-387. *Universal Joints*, Engelman's Autocraft: 213-220. *Torque tube and Torque arm*, Hobbs and Elliott, pp. 400-402. *Differential*, Timken Primer, p. 70. Motor Vehicles, Figs. 235-236. Hobbs and Elliott, Fig. 484. Vacuum Oil Co. booklet.

COURSE OF STUDY.	NOTES ON COURSE.	TEACHING AIDS.
Rear Axles Concluded. Bearings, plain, ball and roller. Oil-less bearings. Universal joint and drive shaft.	Cars using various types: 1. Full-floating: Cadillac, Velie, Winton, Revere, Owen-Magnetic, Locomobile, Mercer, Lexington, DuPont, etc. 2. Three-quarter floating: Case, Chevrolet, Hupmobile, Frant, Noma, Overland, etc. 3. Semi-floating: Apperson, Biddle, Columbia, Essex, Franklin, Holmes, Hudson, Jordon, Liberty, Nash, Packard, Pierce-Arrow, Reo, Stearns, etc. Discuss relative advantages of each. Full-floating used by 47.2% of the manufacturers; three-quarter floating, 17.9%; semi-floating, 33%. Hotchkiss drive; how accomplished without torque arm: long semi-elliptic rear spring, main leaf heavier and of Vanadium steel. Spring eyes and	(Bray-Paramount Film, "Principle of the Differential.") *(Concluded from Preceding Column)* center of axle practically in straight line axle housing securely fastened to rear spring. Drive shaft has two universals. Used by 70.8% of manufacturers. Torsion tubes. Radius rods. Why needed? Discuss shape of axle shaft in semi-floating axle to give uniform strength. Timken Primer, pp. 49. Pressed steel housing almost in universal use on cars costing over seven hundred dollars. Discuss universal joints; metal and fabric.
Wheels. Types, wood artillery, wire spoke, steel disc, single and double, pressed steel, cast steel, cushion wheels. Other unusual types. Relative strength of different types for side thrust and load. Advantages and disadvantages of each type. Materials and manufacture.		*Wheels*, all types, Jan., 1920, Motor, pp. 66-67. H. & E., pp. 403-407. Teachers' outline, Figs. 3-1, 3-2, 3-4.
Brakes. Hub brakes. Contracting band, expanding shoe, brake lining, brake drums, service brakes on drive shaft. Methods of connecting to brake pedal and lever. Provision for taking up, brake equalizers. Treatment of brakes. Testing, relining, sprags.	Discuss importance of brakes. Increasing use of service brake on drive shaft. Materials used in manufacture of brake lining. Properties of a good brake lining. Use of cable instead of brake rods. (Borrowed from European practice.) Adjusting brakes and testing to see that they are properly equalized.	Charts—*Brakes and Equalizers*, Teacher's outline, Figs. 7-1 to 7-8. Hobbs-Elliott, pp. 360-364. Engelman, pp. 111-120. Dyke, pp. —. Timken Primer, p. 52. *Transmission Brakes*, Engelman, p. 119; H. & E., p. 363. *Sprag*—Teacher's outline, Fig. 7-9.
Function of Transmission. Types, sliding gear. 1. Progressive, 2. Selective. Planetary (Ford), Friction disc (Metz). Operation of gear shift lever, progressive type. Quadrant. Gate type, ball and socket. Number of speeds, universal gear shift, gear shift on standard cars. Bearings. Method of mounting in car, unit with engine, amidships, rear axle.	Relative advantages of each type. Discussion of gear ratios. Why necessary to start car in low speed? Discuss and illustrate the mechanics of gears. Method of mounting in cars: Unit with power plant used by 95.6% of manufacturers. Amidship location, 1.8%. Rear axle, 1.8%. Discuss unsprung weight in connection with rear axle location.	*Mechanical Advantage of Gears*. Motor Vehicles, Fraser & Jones. Figs. 213-214. Consult a text on "Mechanics." *Layout of a Sliding-Gear Transmission*, Hobbs and Elliott, Fig. 458, p. 377. Vacuum Oil Co., booklet on Chassis Lubrication gives some good illustrations. Motor Vehicles, Figs. 216, p. 251. Pratt, pp. 105-112 inc. *The Universal Gear Shift*. (S. A. E.) Hobbs and Elliott, Fig. 457. Dodge gear shift, H. & E., Fig. 460. Buick gear shift. *Analysis of Ford Transmission*, H. & E., Figs. 466-467. Motor Vehicles, Figs. 227-228. *Location of Transmission*, Motor, Jan., 1920, pp. 97. Hobbs and Elliott, Figs. 449A, 449B. Pratt.
Clutches. Types: Cone, disc, single plate, jaw, contracting band, expanding. Clutch brake. Care of clutch. Adjustment. Lubrication.	Relative advantages of each type. Disc and plate in ascendancy. Why? Care of clutch: cleaning and applying clutch dressing. Grabbing and slipping. Adjusting. Riding clutch when driving. Properties of a good clutch facing. Cone clutch used by 11.1% of manufacturers. Plate and disc, 87.9%.	*Principles of Cone Clutch*, Hobbs and Elliott, Figs. 450-451-452. Motor Vehicles, Fig. 203. Pratt, Fig. 83. *Disc Clutch*—Motor Vehicles, Fig. 206. Packard instruction book. *Plate Clutch*—Motor Vehicles, Fig. 210. Engelman, page 189.
Steering Gear. Function. Double worm, worm and gear, gear and sector, rack and pinion, planetary (Ford) tiller, component parts, bearings, pitman arm, drag link. Methods of taking up lubrication. Methods of fastening to frame.	Discuss Ackerman steering gear. Discuss why the camber, foregather and inclination of the knuckles or caster effect tend to prevent road shock from being transmitted to the wheel. (For complete discussion of caster effect see "Timkin Primer of Automobiles.") Discuss planetary steering gear as used on Ford and Overland Four.	*Steering Gear Types*—Teacher's outline, Figs. 6-1 to 6-9. Hobbs and Elliott, Figs. 436-440. Engelman, pp. 87-97. Dykes enc., pp. —.

COURSE OF STUDY.	NOTES ON COURSE.	TEACHING AIDS.
Chassis Lubrication. Fundamentals of lubrication, speed, heat, load, front axle, rear axle, spring and shackle. Transmission, steering gear. Study of typical lubrication charts. Frequency of lubrication. Results of neglect.	Study of typical lubrication charts as furnished by manufacturers. Study booklet on chassis lubrication issued by the Vacuum Oil Co. Discuss grease as a chassis lubrication. Note increasing use of oil as chassis lubricant either by Alemite High Pressure system or by oil reservoir and wick. Use of oilless bushings. (Bound Brook Bushings as example.) Necessity for lubricating springs.	Obtain typical lubrication charts as furnished with any car. (Local dealer will supply.) Obtain large 36″ x 60″ charts from Veedol advertising matter. Local company handling Veedol will supply, otherwise from Tidewater Oil Co., New York.
Tires. Classes: Solid, pneumatic and cushion. Structure: A. Solid, B. Pneumatic, 1. Fabric, 2. Cord, C. Cushion (Dayton Airless), D. Tire Fillers. Advantages of each type. Care of tires: Right inflation, misalignment, driving in ruts and car tracks, skidding, etc. Repair of tires and tubes: Vulcanizing, retreading, filling cuts, etc.	Discuss damage done by under-inflation. Discuss over-size tires: greater strength, easier riding qualities, longer life. Discuss misalignment of wheels. Methods of testing for alignment. Damage incurred by driving in ruts and car tracks. Also by sliding rear wheels. Use of tire fillers or cushion tires. Discuss increasing use of large pneumatic tires on trucks. (Good argument against tire fillers or cushion tires.) Study manufacturers' tire manuals: Miller, Firestone, etc.	Cut out illustrations from Tire Manuals and paste on cardboard. Testing for alignments on front wheels, Teacher's outline, Fig. 3-24. Place tire sections on big piece of billboard for display. Cross-section of tire, Engelman, pp. 46. Penna. Vacuum Tire Co. chart (gratis). Brunswick tire chart (gratis). Obtain display of materials used in manufacture of tires.
Bodies. Types: Runabouts, roadster, speedster, touring car, chummy roadster, coupelet or cabriolet, coupe, sedan, limousine, landeau, town car, truck, delivery wagon. Method of framing. Materials: wood, plywood, pressed steel, aluminum. Body lines, tendency in design.	Discuss tendency in body design since time when it resembled buggy body till present streamline body with straight line tendencies. Special body designs, Rubay, Schutte, Brewster, etc.	Cut out pictures of typical cars and paste on cardboard to show tendency in body design.
Engine—General. Simple heat engine. Internal combustion engine. Otto principle. Two stroke cycle principle. Order of events, mechanism of four stroke cycle engines. Valve arrangement: T-head, valve in head, other arrangements as Reo and Essex, Duesenberg engine, valve timing and setting. Knight engine, rotary valve engine. Multicylinder engine. Ignition, clearance and compression. Piston displacement, cylinder cooling, muffling devices and cut outs. Horse power of engines.	**II. ENGINES.** In introducing Engines speak of the waves of air which can be seen rising above a field or railroad track on a hot summer's day. Also above a hot stove. Explain that this is heated air which is expanding or thinning out. Explain the simple heated engine (Iowa State College Eng. Ext. Dept., Teacher's Outline). Then recall the muzzle loading gun (Pratt, The Automobile Instructor, page 8). Explain that an explosion is an instantaneous burning. Apply the foregoing to the Otto or four cycle engine. Explain meaning of cycle: the cycle of nations, etc. Explain meaning of internal combustion engine by showing difference between it and the steam engine. Show roughly the comparative efficiency. Discuss Therman efficiency; i. e., proportion of heat converted into useful work. Discuss valve arrangement: T-head, valve-in-head, F-head or Reo and Essex type. Discuss Therman efficiency of overhead type, mechanical disadvantages. Discuss Stutz, White and Porter 16-valve Four. Pierce Dual-valve. 16 valve heads for Fords (Roof and Craig-Hunt as example). L-head used by 61% of manufacturers. Valve-in-head, 32.9%. T-head by 3.5% of manufacturers. (If possible borrow working model of Knight motor from local Willys-Knight salesroom). Discuss materials from which valves are made. Relative advantages. Valve timing. Should be considered thoroly. Explain why intake valve is left open after piston reaches lower dead center. (Inertia of gases.) Explain why exhaust valve is opened before	*Chart —Cycle Engine*—Eng. Ext. Div., Univ. of Wis. If possible make simple heat engine. (Ia. State Teachers' outline.) Draw chart showing analogy between gun and four stroke motor. Chart showing typical steam power plant. Chart showing heat efficiency and power to rear wheels. (Veedol book.) Draw in colors chart showing different types of motors according to valve arrangement. (Vacuum Oil Co. booklet on engines.) Charts showing valve timing diagrams. Pratt, p. 16; Dyke, p. —; H. & E., p. 21. *Examples of different types of cylinder blocks*—actual blocks or sectional blocks. *Examples of poppet valves.* (Mount on wall board.) Borrow if possible working model of Willys-Knight motor from local dealer. Otherwise draw a large chart in colors showing stroke and cycle of operations in Willys-Knight motor. Label parts. H. & E. 32; Dyke p. 140. Willys-Knight instruction, p. 11. Charts showing power lap. H. & E., p. 37; Dyke, p. 126. Engelman, pp. 242-243-244. Motor Transportation, p. 44. Engine Balance and Firing Order—Charts. Ia. State Teachers' outline. Motor Transportation, chapter 5. H. & E., Figs. 73-78. Bray-Paramount film, "Principle of the Gas Engine."

COURSE OF STUDY.	NOTES ON COURSE.	TEACHING AIDS
	Engines Continued.	*(Concluded from Preceding Column)*
	piston reaches bottom of power stroke and why held open from 5 to 10 degrees past dead center.	three (Chandler for example), en bloc. Relative advantages.
	Discuss multi-cylinder engine, mentioning early one and two cylinder cars, Oldsmobile, Cadillac, Northern, Orient Buckboard, Covert and Packard single cylinder cars.	Pistons cast iron. Aluminum, semi-steel piston rings. Cylinder cooling, water cooling system almost universal, pump and thermo-syphon.
	Ford, Winton, Reo, Maxwell-Briscoe, Haynes-Apperson, etc. Two cylinder cars. Why tendency toward more cylinders? Explain power lap (see Dykes' Enc.) Six used by 57.9% of manufacturers. Four, 30.9%. Eight, 7.9%. Twelve, 2.3%. Six using overhead valve predicted to be almost universal type of future. Cylinder arrangement, vertical, horizontal, V-motor, cast singly, in pairs, blocks of	Franklin, Holmes, Parenti and Cameron.
		Motorcycles and airplane engines (air cooled).
		Advantages and disadvantages of each method.
		Horse power measurements. Formulate and testing.
		See Ext. Div., Univ. of Wis., Gas Engine course for complete discussion of gas engine principles. Dykes enc., Hobbs and Elliott and other books for discussion of automobile engines.
Engine Lubrication.		
Necessity for lubrication. How a lubrication acts, forms a film between shaft and bearing.	Point out that lubrication is the prime consideration in operating a car. Lubrication difficulties are met in the V-motor and that full force feed is the only solution. Call attention to baffle plate on one cylinder of V-motorcycle motor.	*Engine Lubrication*—Charts (Sinclair Refining Co. Book).
Effects of cutting and grooving. Classification of oils according to base, solid, liquid.		Vacuum Oil Co. booklet. Motor, Jan., 1920, page 96.
Essential requirements of a good lubricant. Oil tests and the significance of each.	Discuss lubrication systems.	*Oiling Charts*—Obtainable from motor car dealers.
Choice of lubricant dependent upon: Pressure or load, speed, temperature.	Explain oil pumps. Note tendency to regulate amount of oil pumped according to speed of engine. Oil gauges, pressure and oil level. Test some old vile oil drained from crank case by drawing big horse shoe magnet thru it to pick up iron and steel particles.	Veedol chart—35" x 60" (gratis).
Parts of engine requiring lubrication: crankshaft, crankpin, crankpin and wristpin.		Veedol book—Drawn in colors.
Lubrication systems:		*Oil Pumps*—H. & E., pp. 117-118-119.
a. Splash.		Engine cooling charts—H. & E., Fig. 136-138.
1. Non-circulating.		Pratt — Figs. 33-34-35-36-37. Motor, Jan., 1920, p. 96.
2. Circulating.		Franklin instruction book.
b. Mechanical or force feed.	Emphasize need for frequent draining of crank case oil and flushing with kerosene, refilling with fresh oil.	
1. Force feed and splash.	Study typical lubrication charts.	
2. Force feed.	Splash system used by 9% of manufacturers; force and full feed, 20.4%; force feed and splash, 70.6%.	
3. Full force feed.		

(To be continued)

WILLIAM AND MARY FURNITURE

Leslie G. Martin

THE reign of William III and Mary of England was one of importance and interest to students of art history. Both these monarchs were interested in furniture and decoration and many changes were brought about thru their influence upon the style of English furniture and interior decoration. The changes which they caused are generally referred to as the Dutch influence. In his residence at Hampton Court Palace, William destroyed the state rooms of Henry VIII and had them entirely rebuilt under the direction of the great architect, Sir Christopher Wren. The king's taste in furniture and decoration had a considerable effect upon the nobility and the members of the court and these classes were the chief patrons of the furniture makers.

During the time of William and Mary, walnut was used chiefly for the construction of furniture and later in the period, the custom of bleaching the wood was introduced.

During this reign, the chair was an important piece of furniture and several notable changes were made in its design. The carved stretcher which had been placed between the front legs, or slightly back of the front, between the side rails, was superseded early in the reign of William III by a serpentine stretcher, shaped like the letter X. Sometimes this stretcher was finished with a turned finial in the center. The legs were sometimes carved with a Flemish scroll, or were turned with a bulbous shape, like an inverted cup or bowl. This cup is Portuguese in origin and is perhaps the most familiar feature of William-and-Mary furniture that is reproduced in modern adaptations. The bulb-shape was often combined with a Spanish foot.

State chairs were very elaborate with carved mouldings and acanthus leaves. The legs were square and tapering and were carved with stopped flutings and nullings.

Velvet, and gay chintzes and printed cottons were used to cover the chairs. The more elaborate types were

covered with crimson velvet and silver embroidery, and the edges of the seats were finished with long fringes.

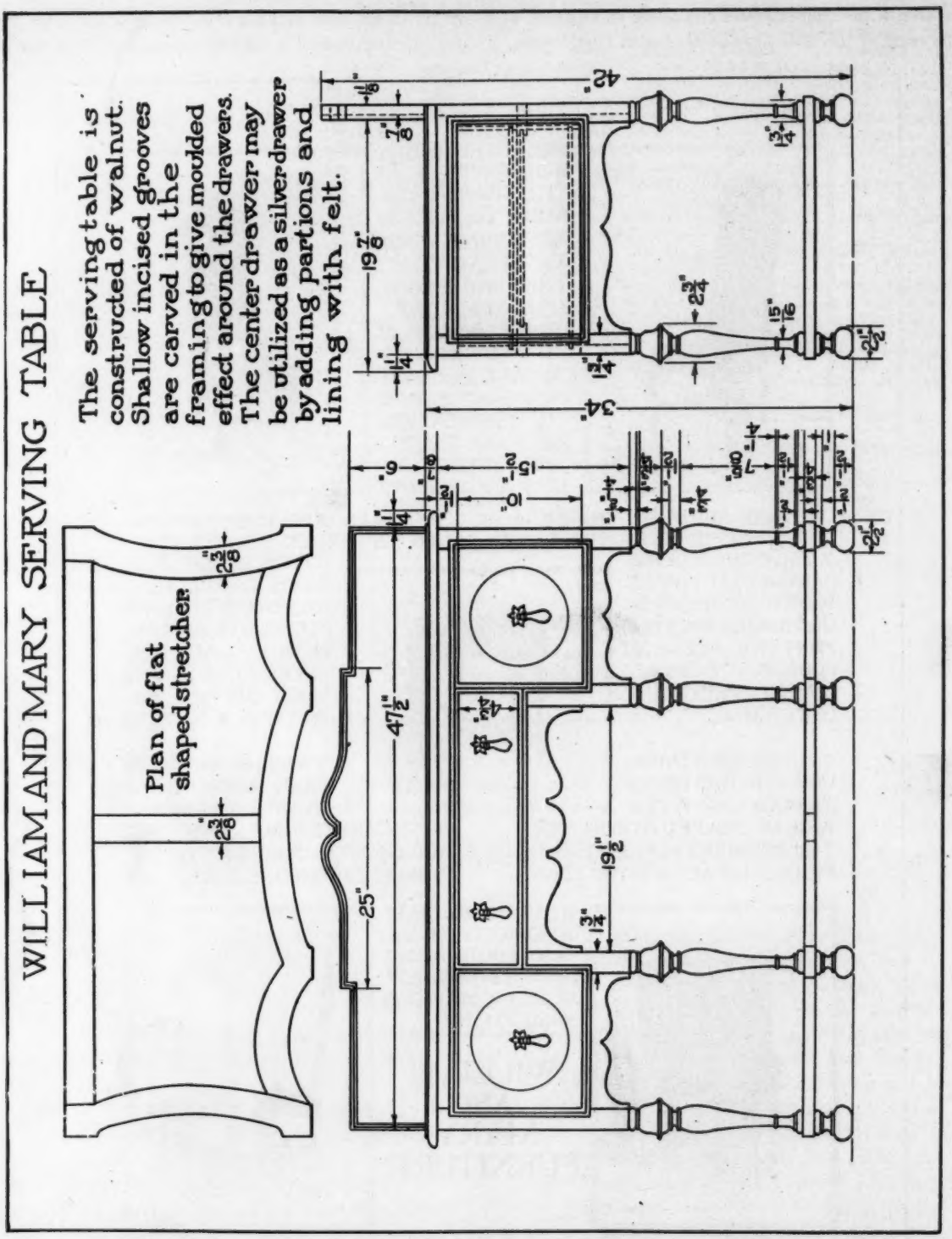
reign, finials were omitted from the back and legs, and the top rail formed a capping which was often carved

DRESSING TABLE 1690-1700. WALNUT THE TURNED LEGS SHOW THE INVERTED BOWL SHAPE WHICH WAS A FEATURE OF THE FURNITURE OF THAT TIME. THE UNDERFRAMING IS SHAPED AND HAS SMALL PENDANT DROPS IN THE CENTER. THE DRAWER PULLS ARE PEAR SHAPED. THE STRETCHER IS SHAPED LIKE AN "X"
1. WILLIAM AND MARY CHAIR-1688-1702. SHOWS THE FRENCH INFLUENCE. THE EVOLUTION OF THE CABRIOLE LEG IS HERE SHOWN FROM LOUIS QUATORZE RATHER THAN FROM THE FLEMISH DOUBLE "C" SCROLL. DOUBLE SERPENTINE STRETCHER.
3. WILLIAM AND MARY CHAIR - 1700. THIS CHAIR SHOWS THE DUTCH INFLUENCE, WITH A BOLDLY DESIGNED BACK AND PIERCED CRESTING. DETAILS LACK THE PRECISION OF FRENCH WORK. SEPERTINE ITALIAN STRETCHER.
4. CHEST ON STAND, 1700-1710. HAS TURNED BULBOUS LEGS WITH A FLAT SHAPED STRETCHER. THE DRAWERS HAVE A SMALL MOULDING AROUND THE EDGES.
5. WILLIAM AND MARY CHAIR; 1689-1702. THE CHAIR IS ORNAMENTED WITH CARVED SCROLLS, MOULDINGS AND ACANTHUS LEAVES. THE BACK IS CANED. SERPENTINE STRETCHER.
REIGN OF WILLIAM AND MARY - 1689-1702. PHOTOGRAPHS SHOWN BY COURTESY OF THE METROPOLITIAN MUSEUM, N.Y.
WILLIAM AND MARY FURNITURE

TYPICAL EXAMPLES OF WILLIAM AND MARY FURNITURE.

The chair legs often ended in bun feet. The backs were fitted with splats, with carved and pierced designs, or with a central panel framed and carved. Other chairs of the period had upright laths. Later in the and pierced and constituted the top of the back.

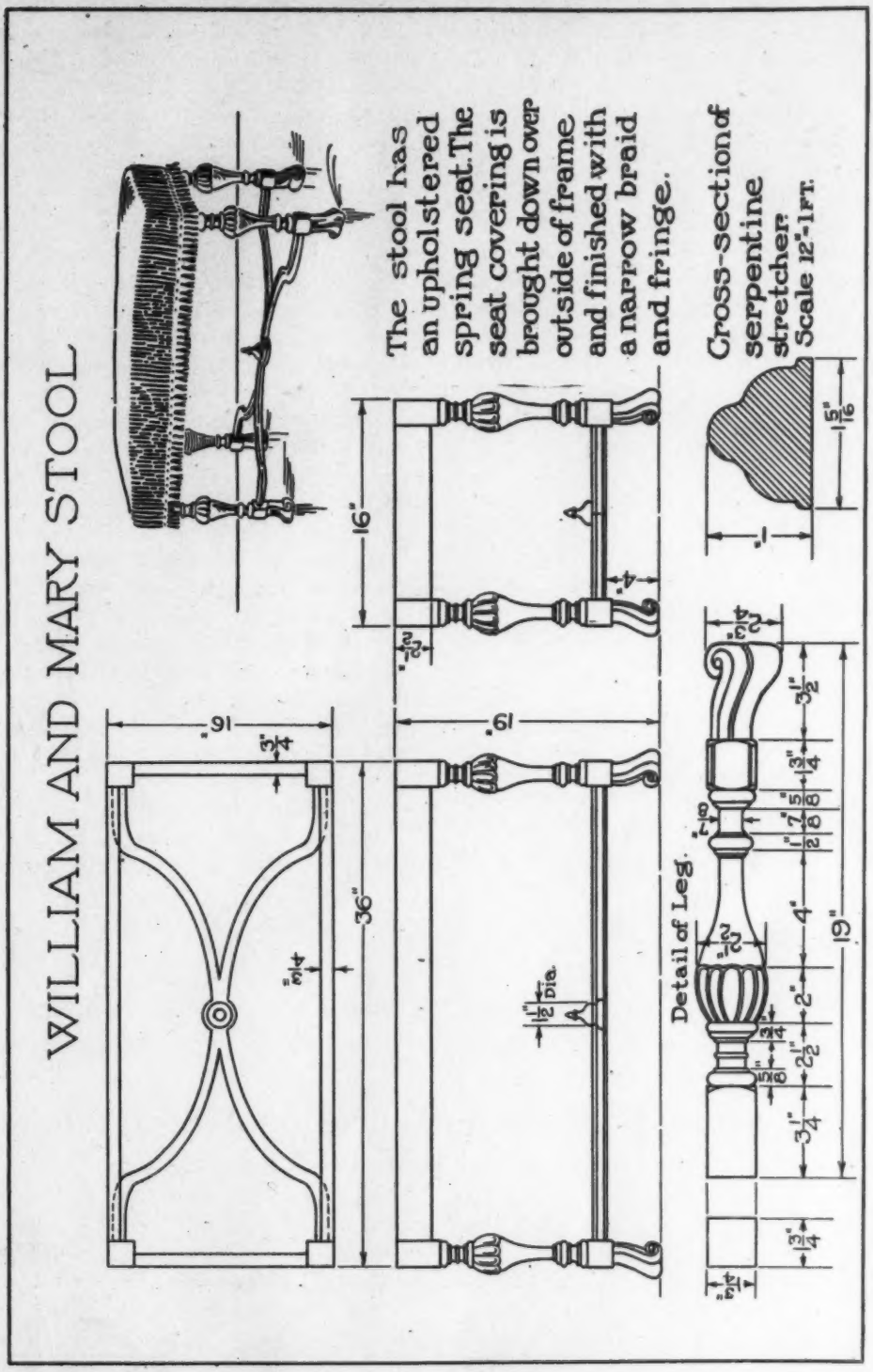
The larger chairs were made more comfortable than those of the earlier periods and cane was combined with the splat, making the back smoother. The legs of


WILLIAM AND MARY SERVING TABLE
The serving table is constructed of walnut. Shallow incised grooves are carved in the framing to give moulded effect around the drawers. The center drawer may be utilized as a silver drawer by adding partions and lining with felt.
Plan of flat shaped stretcher
42"
34"
25"
19 7/8"
47 1/2"
19 1/2"
15"
10"
6"

the larger chairs were often of the broken-cabriole type, ending in a club foot. The final development in the chair back was the omission of cane and the decoration of the central splat with a carved-and-pierced design of a very intricate pattern. Open scroll work, with a hooped cresting at the top, was considerably used.

During the period, many of the chairs of the preceeding periods were reupholstered and put to use. Dining chairs gradually took the place of stools for use at tables of the more wealthy and were often made in sets.

The stool was a common form of seat during this reign. About 1690 stools with square, tapering legs were used, and the frames were carved in low relief. While the majority of stools were finished in the natural walnut, some were painted with black and gold to


WILLIAM AND MARY STOOL
The stool has an upholstered spring seat. The seat covering is brought down over outside of frame and finished with a narrow braid and fringe.
Cross-section of serpentine stretcher. Scale 12"-1FT.
Detail of Leg.
16"
36"
19"
4"
2"

harmonize with pieces of lacquer work and marquetry. Very frequently the stools had legs similar to chair legs and were made with serpentine stretchers. They were often upholstered to match the chairs. Ogee framing, with carved acanthus decorations, was very popular, and the square legs were often capped with a carved gadroon decoration.

Long seats and circular seats were also constructed during this reign, but double seats were rare during the later years. The long seats, or settees, often had backs with carved cresting at the top. Square, moulded legs were features. They were usually open and the sides and backs were covered with velvet and embroidery, or with printed patterns showing birds and trees.

The next development of stool legs was the inverted cup shape, with the sides cut away. The legs terminated in Spanish feet. Triple shaped Italian stretchers were used to unite the legs. Later the legs developed from the Flemish into the cabriole type.

The chests were usually simple and were made with raised panels and mouldings and simple carving. The prolongation of the sides for feet was later eliminated and bracketed corners, or ball feet, became the custom. The chests were often elaborately decorated with inlay. Some were of an unusual shape, with three large drawers in the upper part and one long drawer beneath, capped with a bold moulding; others had feet shaped like claws and were veneered. Handles of various types were used. Some had drop handles of brass; others were elongated, pear-shaped or flattened like a flower bud. Later on ring handles were used.

The chest of drawers on a stand dates from the early part of the William-and-Mary reign. Some of the details of the woodwork were similar to those of preceding periods. They were modeled after the cabinets of Charles II, and were sometimes supported on twisted legs with shaped stretchers. Turned legs with the inverted cup shape were also used. The doors had drawer fronts covered with elaborate marquetry designs in rectangular panels and ovals, and were sometimes veneered. The drawer pulls were usually of the hollow drop pattern, with star-shaped rose designs. Some had semi-colored heads, with a fan-shaped inlaid decoration near the top. Holly, pear and ebony were used for inlaying. The upper part of the chests was usually plain, with a gracefully shaped outline on the lower part. The center part of the framing was sometimes lifted in the form of an arch, with small drawers on each side.

The tables were similar in design to the Jacobean and were usually of walnut. The first changes were the introduction of the inverted-cup turning on the leg and the X-shaped stretcher. Sometimes there was in the center a small flat space for holding a vase or a turned finial. The turned leg was superseded by the cabriole. The cabriole leg was used with the escallop decoration and the ball-and-claw foot. Tables with flaps were made for dining-room use. These were usually oval shape, and the half-round moulding on the edge of the table top was carved with a bold acanthus pattern. The frame which was plain, had a drawer and was finished in veneer. Decorative heads were carved on the scroll legs, and inlay of cedar and boxwood was used quite freely.

William-and-Mary desks were usually rather plain, with a sloping front. Some were solid and dignified, and severe in outline, showing the influence of the architecture of the period. The top was surmounted with carved cornices, fine mouldings, and broken pediments, while the lower part contained large drawers. A more simple type was mounted on cabriole legs and used as a dressing table.

The bureaus in use in this period were surmounted with cabinets. The cabinets had doors with panes of glass set in geometrical patterns. These glass doors were also used for the bookcases and china closets. Marquetry was also used considerably for decoration. Small bureaus were placed on stands with twisted legs. The legs had ball centers, and the drawers were fitted with brass drop handles. The sloping lid was supported with runners which pulled out, revealing several small drawers. In the lower part there were also two or three large drawers.

Wardrobes were not much used until the reign of Queen Anne. They were solid and dignified, and the protruding knees showed the Dutch influence. Rich and elaborate decoration was obtained with inlaid marquetry designs.

The court bedsteads of the William-and-Mary period were four-posters, which were hung with velvet and other rich materials.

Supervised Study for Vocational Students

Walter R. Mason, Instructor in Related Subjects, Altoona, Pa.

WITH the coming of Smith-Hughes vocational courses into the cosmopolitan high school, new problems present themselves. In the traditional program of seven or eight periods a day, there has been ample provision for study periods in all courses. Since the minimum daily requirement in federally aided courses is six hours of sixty minutes each, it can be readily seen that no time is available to be scheduled for preparation within the average school day. The pupil is still further handicapped if he has a job after school hours, as many of our own boys have. It is assumed that the Altoona High School is a typical example, in general, of schools having vocational courses working under this system.

The boys are scheduled for an eight-period day, each period of 45 minutes duration. Twenty periods of the week are devoted to shop work, and the other twenty periods to related and academic work.

The problem confronting the teacher of vocational classes in related and academic work is readily seen, and this problem is perplexing, to say the least. How is the teacher going to get efficient work out of the pupils, when all of their time is taken up during school hours, and in a great many cases, their time devoted to work, outside of school hours?

We find that the subjects taken by the vocational student are more technical in their content, especially the related subjects, than are those taken by the aca-

demic student. For example; the vocational student is given courses in trade theory which embraces entirely the technique of the trade he is following, together with a great number of trade terms and various formulae for the working of his particular shop problems. Another example would be that of trade science, wherein the various principles of physics and chemistry are presented in terms that apply to vocational work, and are therefore sometimes very hard to grasp by the pupil, such as chemistry of materials, and principles embraced in the laws of physics as applied to the various machines, appliances, and tools, used in the shops.

One solution to this problem is to divide the class period in such a way, that the student will be enabled to prepare in part, his lesson assignment for the following day, and also cover the ground embraced in the lesson for the day. This can be accomplished by taking probably five minutes at the beginning of the period for a short review of the important features and points of the work under discussion, that has already been covered. The following fifteen minutes of the period are devoted to the lesson of the day, with blackboard illustrations and discussions when necessary. The remaining twenty minutes are devoted to the study of the assignment during which time the pupil could be best aided by the teacher thru the medium of "Supervised Study."

In supervising the study of the assignment, the pupil is taught the best method of preparation and of delving into the subject matter and being able to grasp which are the most important points forming the content of the treatise on any one particular phase of a subject. In this way, the pupil is taught not to devote too much time to the less important points, but to get at the bottom of the subject, dig out the important factors, and then support each by the less important points. In other words, it places the work done on assignment on a high plane of efficiency, higher than that which would have been attained by the pupil, had not the most important points of the lesson been brought to his attention thru this form of class procedure. Thus a pupil can cover more subject matter in the time devoted to the study of the assignment, than he could have done unaided.

No matter where we investigate classes, we find that there is a certain percentage of the class not as quick at grasping book matter as other members. In vocational classes, under conditions I have cited, supervised study will be of untold value to such pupils, as it gives the teacher the opportunity to give individual aid where it is needed, and thereby helps the pupil to keep pace with the class as a whole.

The reader may question the success of this plan, where one has only 45 minutes to cover so much detail matter. We all acknowledge that an ideal system would embrace a double period, but this requires an extra teaching force and a longer school day. Schools, in general, have not seen their way clear to expend such large funds in the maintenance of any one particular school system. Such systems are coming, and we hope that it will be soon because advanced ideas along educational lines demand it. The best we can do at present is to make the most of the situation as it is, and be ready to adopt the newer system when it comes, not as inexperienced instructors among new ideas, but experienced, in that we had practiced them, before they were inaugurated into the school system as a definite step towards educational advancement.

To preserve the interest of the pupil in his work, there is not a better method than that of supervised study. It indirectly makes a pupil more individualistic, creates new habits, better attitude, and develops skill and concentration.

I believe that Hall-Quest spoke great truths when he said: "Supervised study is that plan of school procedure whereby each pupil is adequately instructed and directed in the methods of studying and thinking, that his daily preparation will progress under conditions most favorable to a hygenic, economical, and self-reliant career of intellectual endeavor."

> Time, place, and action may with pains be wrought,
> But genius must be born, and never can be taught.
>
> Dryden, Commendatory Verses

INDUSTRIAL-ARTS MAGAZINE

E. J. LAKE S. J. VAUGHN
Editors

EDITORIAL

THE ALL-PURPOSE SHOP.

THE so-called "all-purpose" shop is steadily finding its way into the schools. It has some fundamental reasons for existence. The manual training work has been too narrow and confined. There is a place for a shop fitted with a kind of composite equipment where a variety of materials may be used and where different lines of related activities may be engaged in. For instance, it frequently is desirable to work out problems in a course in woodworking which require a certain amount of work in iron or sheet metal. It would seem entirely feasible and desirable to have certain simple parts of equipments for iron and sheet metal work in the same shop with the woodworking equipment, or better, to have a kind of composite equipment which might be used for both purposes. It is conceivable that simple electrical equipments might be combined with the other shop equipments so that work requiring a combination of lines of activity including some electrical construction might all be completed in one shop.

It will be observed that we have said equipments for "related activities." We are not in sympathy with a movement which would make a great conglomeration and which anticipates the carrying of several separate and distinct lines in the same shop. Thus, it would seem to us to be anything but an ideal arrangement to have a printing equipment in with totally unrelated work such as woodworking, sheet metal, etc. Altho this has been attempted with considerable success in some places, the combinations of equipments have been due to lack of space and have not been definitely planned with a view to securing in this way an ideal arrangement.

From the teaching end of the problem, we are disposed to feel that the confusion incident to the carrying on of a variety of unrelated lines of work in the same shop would materially weaken the effectiveness of the instruction, lower the quality of the work, and destroy something of the spirit of the single-purpose shop. We shall watch with interest the experiments along this line, in the hope of finding a plan that will enrich the work of the ordinary manual training shop without sacrificing any of its proven values.

SALARY AND SERVICE.

COLUMNS and cartoons have appeared in the magazines representing a deplorable financial and social condition of underpaid teachers. This propaganda has been directed toward the raising of salaries for teachers, yet we surmise that few salaries have been raised on the strength of it. Salaries for teachers have gone up in most cases where and when the demand for teachers has exceeded the supply. At present the demand exceeds the supply, and salaries will be governed by this condition. Once established, a higher scale of salaries for teachers will be maintained if money is made available for the schools. Money can be made available only by increased taxing power and private donation. Private donations for public education is not to be depended on and is not compatible with democratic standards.

One writer suggests that to make the profession of teaching appeal to the capable young men and women of our schools, examples of success in scholarship and the business of education must be pronounced to them. This pronouncement is due and warranted, but we do not interpret this suggestion as implying that success is to be measured in terms of dollars acquired by teaching. In terms of dollars a good teacher will be underpaid just so long as the market value of efficient public service is underestimated, and that condition has existed since the first unselfish act was performed. Sincere, unselfish instruction will always be underpaid because it cannot be put on a purely financial basis.

On the other hand a fair income in the God fearing, ambitious profession of teaching does not lack the pronouncement of example. Every school system of the land has examples of men and women who have gone into the schools in a spirit of service, and have acquired the most enviable standing in the community by sensible, persistent, and capable effort. What more does any profession offer except the opportunity for unearned financial profit?

SPECIFIC AND GENERAL.

IF the teacher or preacher or artist of 1950 retrospects on education or theology or art, he may note that the first half of this century was devoted to a revision of methods and purposes in his respective line. He may reason that conditions of life changed rapidly, and that these important changes in method were of necessity adapted to the conditions. Occupations multiplied and became specific. Social organizations devoted to the study of specific conditions became numerous. Sects and cults sprang up over night. The whole social and economic world seemed confused and disorganized.

Then, too, he may note that the element in common with important sects, cults, and creeds was a recognition of the individual and his right to the development of his own individual abilities as a member of society and for the good of mankind. He may also note that the revision of methods adapted to education, theology, and art was based on this common element—the rights of the individual as a part of society.

The majority looks no more askance at the minority than the minority at the majority, but the majority must have its way in the matter. When a majority

recognizes the necessity of specific education versus general education in the development of the individual, the improvement in school methods will grow apace, and boys and girls will be cultivated according to their possibilities with the same care that the agriculturist devotes to a variety of plant and animal life. The human animal is not conformable to a common mental treatment in greater degree than he is to a common medical treatment, and common medical treatment is on the decline. We wonder if it would not be advisable for teachers and school authorities to *spend a year at home* in the study of their particular problems in view of their general understanding of general education. Provincialism is the least dangerous and prevalent of our American maladies.

We need many special schools for special communities, because the people of these communities have specific problems. General education applies to their needs only in the way it applies to all of humanity. The obligation of the school is not satisfied by turning these children out with a scant ability to read, write, and figure their small accounts, but must prepare them for a particular kind of work possible to them, and must prepare them thoroly in that work. Herein lies the great problem of Industrial Education.

RESOLUTIONS.

THE resolution of the National Education Association stresses "the crying need that general or cultural education must not be overshadowed by vocational training; that on the contrary, it be emphasized and strengthened and animated along the whole front of educational activity; that in the changed order of things today there is still no excellence without great labor, and that no adequate education can be secured by the youth of America without paying the price in long years and hours of hard intellectual efforts."

Here are three statements. The first implies a danger that vocational training threatens to overshadow general or cultural education. The second statement is that general or cultural education needs strength and animation. The third statement is that excellence in education can not be attained without prolonged labor and study. It was hoped that this organization would develop some definite instructions bearing on the educational problems of the day in place of a doubtful implication and a restatement of well known facts.

There is little evidence from the results in vocational training that any other form of school activity has or is likely to suffer from, a dominance of vocational training. Even with the incentive of federal aid, vocational training has not and probably will not disturb the order or quantity of general and cultural study. In fact it is especially designed to avoid that particular disturbance.

Of the need of strengthening and animating general and cultural study so that it may inform and cultivate, there can be no question. The problem lies in the method of strengthening and animating the academic routine of study, and it is a problem that may well be undertaken seriously by educational organizations. We believe that the solution lies in the direction of making general and cultural study bear more upon the conditons and activities of our present social and economic life.

As to prolonged labor and study by the American youth, we realize that the schools must be increased and strengthened to care for this demand. At present our schools are overcrowded and undertaught. If laws were enforced compelling prolonged attendance, the schools could not at present care for the increased numbers.

If more labor and study may be secured under the present organization and attendance, it is a matter of subjects, teachers, and methods of instruction which can be considered in a specific way by our educational organizations. Let us hope that more than doubtful implications and commonplace resolutions may be forthcoming from the National Education Association.

WORDS VERSUS WORK.

"WHAT an awful trade that of Professor is—paid to talk, talk, talk!

"I have seen artists growing pale and sick whilst I talked to them without being able to stop. It would be an awful universe if *everything* could be converted into words, words, words."

This is quoted from the private letters of a famous college professor who is notable for his many lectures and publications. It is a confession that might be made by many teachers.

If the lecture method of instruction had not been held in restraint by the laboratory method, we might have seen as many ear trumpets as spectacles in the classroom. Our poor eyes have failed with much reading and our poor ears are confused with much listening, while our hands are still idle in much of our educational process.

Some years ago a fine old gentleman, now long since gone to his rest, enunciated this motto as the guide of his life: "I am endeavoring to so conduct myself in the trade which I have chosen that it will be a better trade because I have been connected with it."

The cause thou fightest for, so far as it is true, no further, yet precisely so far, is very sure of victory. The falsehood alone of it will be conquered, will be abolished, as it ought to be; but the truth of it is part of Nature's own laws, co-operates with the world's eternal tendencies, and cannot be conquered.—*Thomas Carlyle.*

Men must ultimately be rewarded in accordance with their ability, rather than in accordance with their membership in any union or family—*Roger W. Babson.*

PROBLEMS AND PROJECTS

The Department of Problems and Projects aims to present each month a wide variety of class and shop projects in the Industrial Arts. Successful problems are invited and will be paid for. A brief description of constructed problems, not exceeding 250 words in length, should be accompanied by a good working drawing. The originals of the problems in drawing and design should be sent.

Problems in benchwork, machine shop practice, turning, patternmaking, sewing, millinery, forging, cooking, jewelry, bookbinding, basketry, pottery, leather work, cement work, foundry work, and other lines of industrial-arts work are desired for consideration. The editors will not accept the old hackneyed problems of footstools, taborets, towel holders, etc., which have been made from time immemorial, ad nauseum.

Drawings and manuscripts should be addressed: The Editors, INDUSTRIAL-ARTS MAGAZINE, Milwaukee, Wis.

A GLUING TABLE.

J. Douglas Wilson, Riverside, Calif.

As most manual training teachers know, it is rather difficult to clamp boards together without help, especially when it comes to putting the clamps on the under-side of the boards. A table similar to that illustrated in the drawing will do away with that trouble.

The drawing is almost self-explanatory. First a table about 3′ x 12′ is made. No comment is necessary on the table other than it be well constructed. Thirty inches in height is very satisfactory.

On each edge of the table two beveled cleats or strips are fastened with just enough space between to form a groove in which the clamp blocks may freely slide. After the blocks are in the groove a small block at each end fastened securely will stop all chances of the blocks being lost. The bevel on the sides of the blocks answers the same purpose.

The clamp block can be made of maple or any hardwood, but cast iron is preferable. By cutting most of the bottom of the block away only a small bearing surface at each end is left. This reduces materially the chances of the block and table being glued together by the surplus glue which invariably squeezes out. A good coat of machine oil on both blocks and table, repeated occasionally will keep the glue from adhering to the blocks and table.

Another qualification of the table is the ease with which boards of varying length can be glued up. One person alone can easily clamp long pieces.

The operation of the table is as follows:

(1) Determine the number of clamps necessary to be used in gluing the boards and space the clamp blocks at equal distances apart for one-half the number of clamps necessary.

(2) Lay clamps in slots provided for them.

(3) Adjust all the clamps to the proper width.

(4) Lay boards to be glued on top of the clamps and glue all the edges of the boards. Then partially tighten all the clamps, but not too tight or the boards will "buckle."

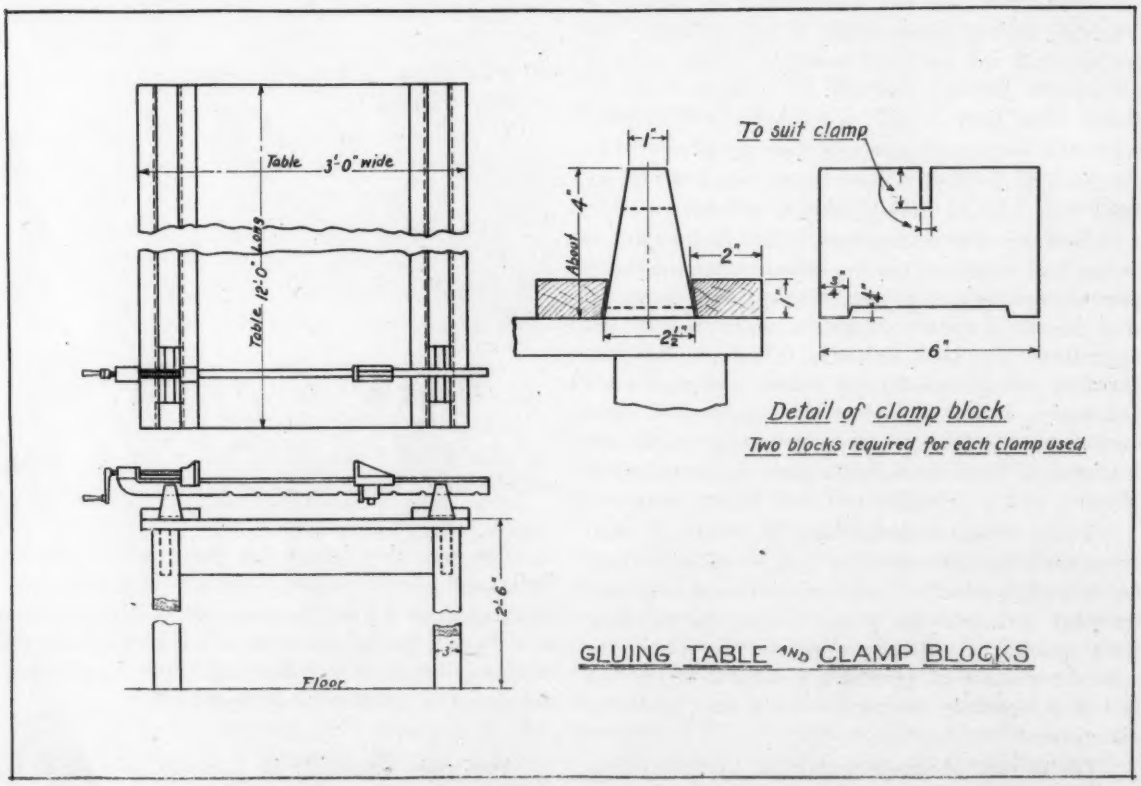
(5) Then place balance of clamps at equal distances on top of the board and tighten all the clamps as much as possible.

This completes the operation and the clamped boards can be lifted out of the clamp blocks and set aside for glue to dry.

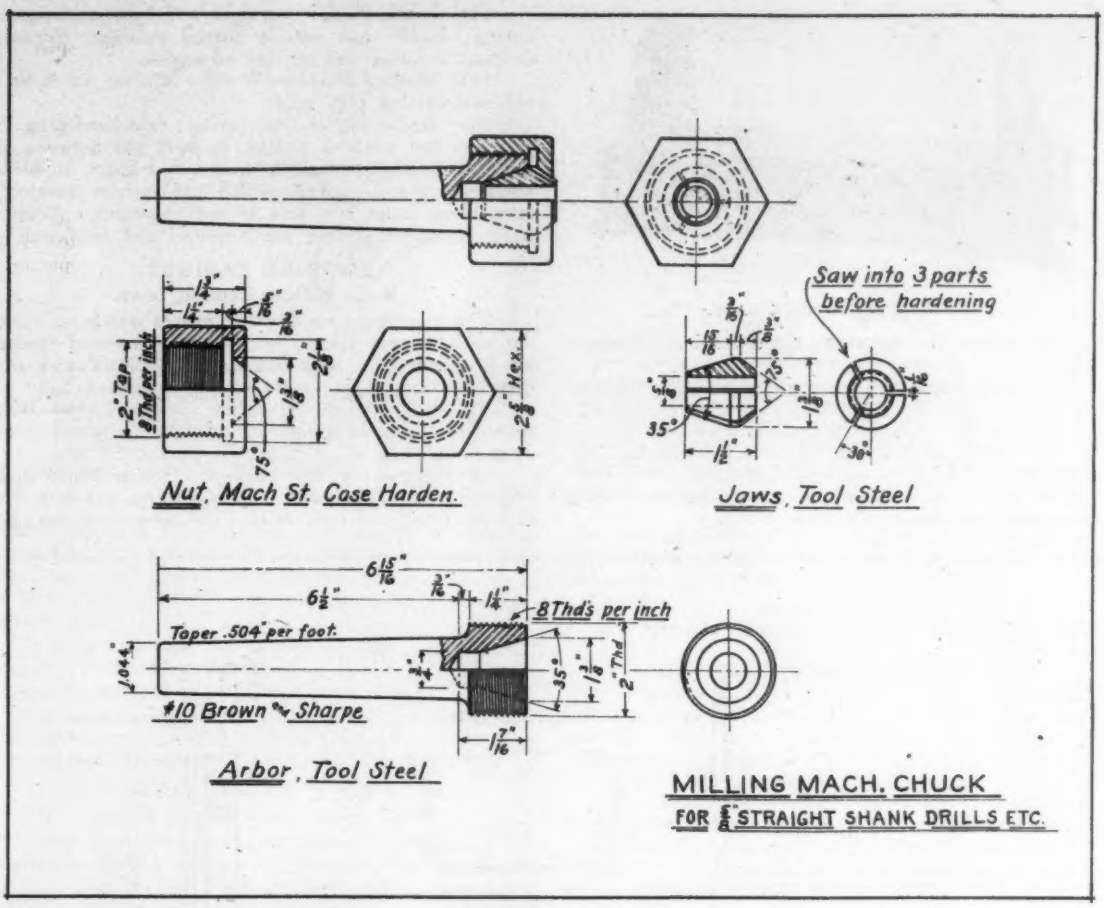
MILLING MACHINE CHUCK.

John H. Faust, Machine Shop Instructor, Mt. Vernon, N. Y.

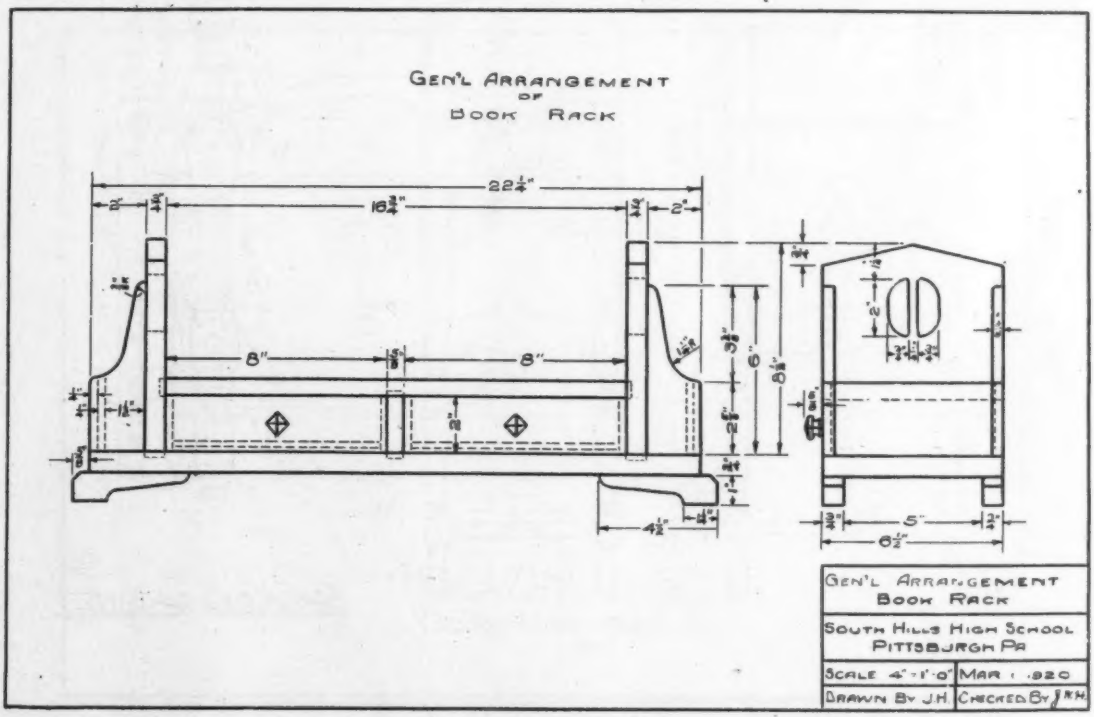
The accompanying drawings and pictures illustrate a chuck which is used in a milling machine to hold small end mills, drills, dove-tail and "T" slot cutters having straight shanks. It is not limited to one size, but may have numerous sizes of jaws to suit the cutters which are to be used. Fig. No. 1 shows chuck holding a "T" slot cutter, size 1/2″ x 1″. No difficulty was ex-



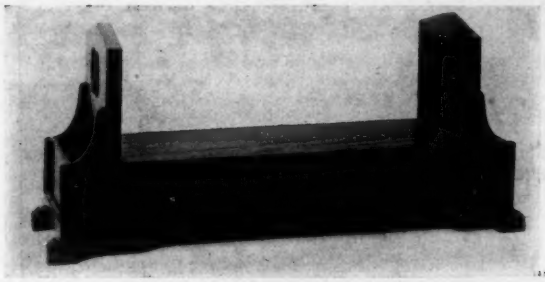
DETAILS OF GLUING TABLE.


Saw into 3 parts before hardening
Nut, Mach St. Case Harden.
Jaws, Tool Steel
8 Thd's per inch
Taper .504" per foot.
#10 Brown & Sharpe
Arbor, Tool Steel
MILLING MACH. CHUCK
FOR 5/8" STRAIGHT SHANK DRILLS ETC.

DETAILS OF CHUCK.



DETAILS OF BOOK RACK.



THE COMPLETED BOOK RACK.

perienced during this operation, the chuck holding cutter firmly.

The chuck mentioned was made to fit a No. 10 taper (B & S), but may be made to fit any size. It may also be fitted to hollow of dividing head and used for holding drill rod when making drills and end mills having straight shanks.

As a project, it is an excellent one, because it comprises numerous operations, such as:

(1) Lathe Work:—Straight and taper turning and boring; inside and outside thread cutting; recessing; drilling, reaming and turning at angles.

(2) Milling Machine Work:—Milling six faces on nut and cutting jaws apart.

(3) Hardening and tempering; case hardening.

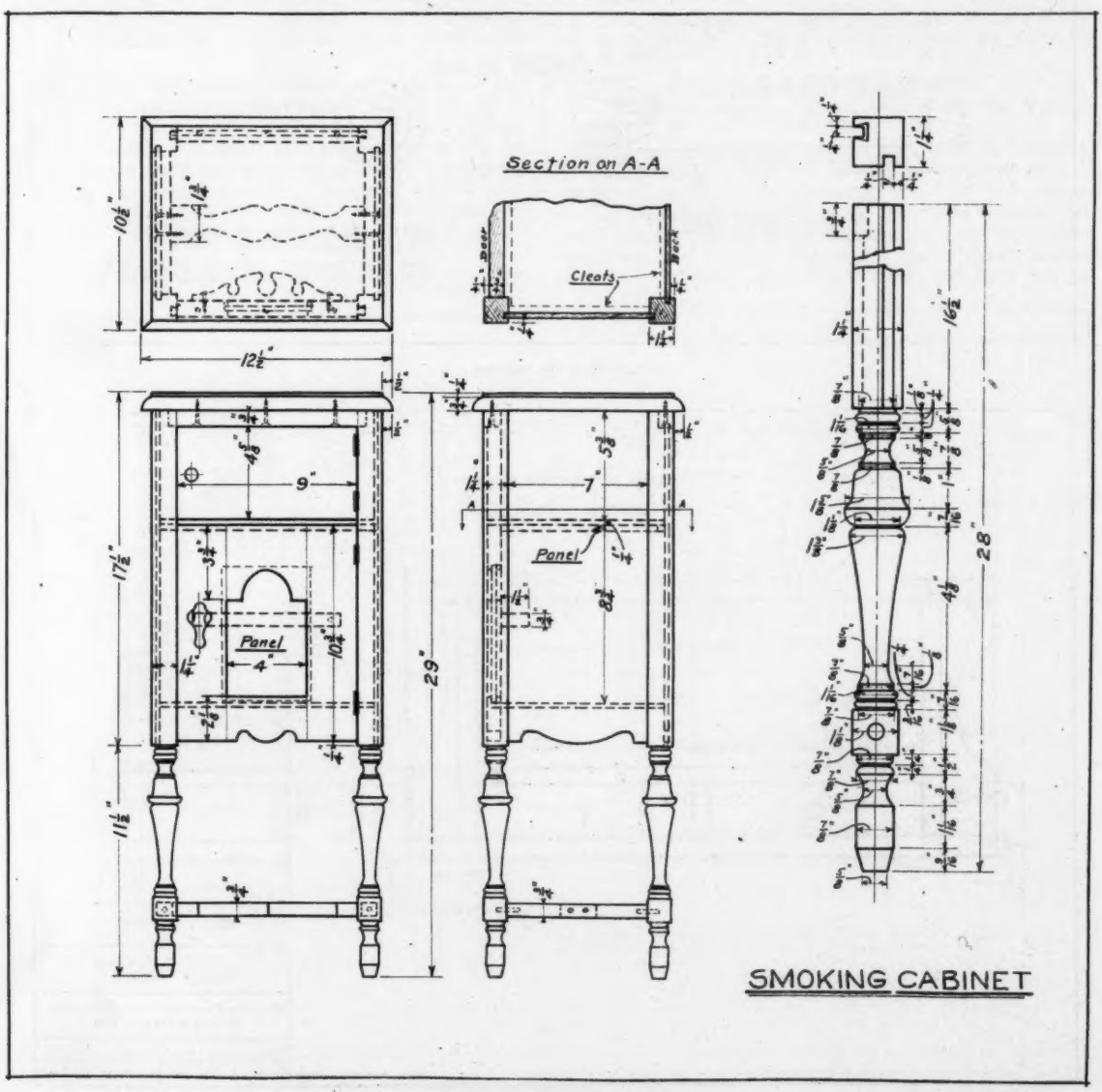
The jaw stock is drilled, reamed, put between centers and finished complete, then sawed apart in milling machine. Holes may be drilled and springs inserted to keep them apart, but this is not necessary. After all work is completed they are hardened and tempered.

SMOKING CABINET.

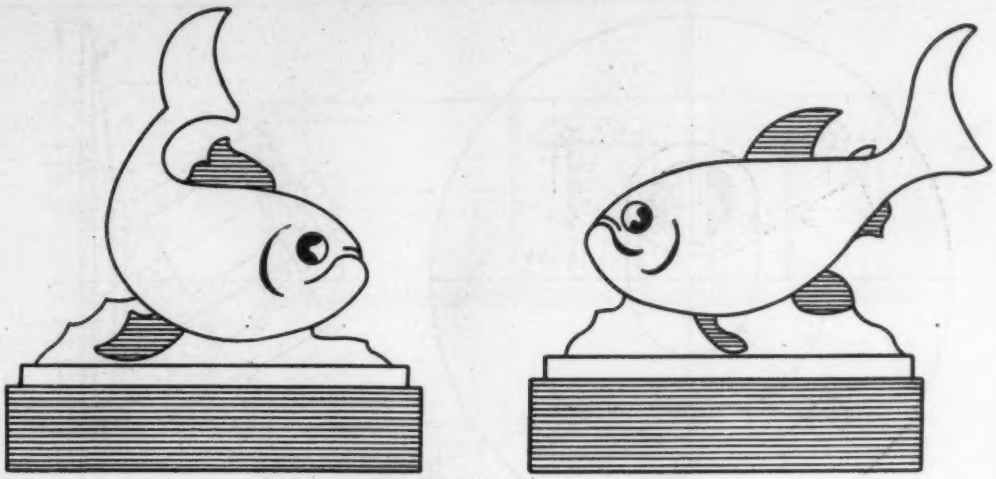
R. L. Wilson, Keokuk, Iowa.

The accompanying drawing is one which we worked out with several others, to give our advanced students an inspiration in correlating their cabinet and wood turning work. This design can be utilized equally well on any small cabinet, as sewing, medicine, etc. It has gained considerable popularity among older people as well as the students.

In constructing this cabinet we have found it advisable to assemble and glue the ends first and then dovetail the front and back rails. The cabinet is assembled



DETAILS OF SMOKING CABINET.



SUGGESTIONS FOR STATIONARY TOYS.

without the back panel as the rails should be fastened to the top with screws. These screws are countersunk within the panel groove, on account of the narrowness of the rails. The rail is then fastened to the top—re-assembled and glued.

A pipe rack may be placed on the inside of the lower door. The knob of this door is the knocker style, which adds much to the cabinet's quaintness.

We have been able to obtain black walnut for all cabinets constructed on this style. The finishing is done with hot wax, which makes a very nice finish.

STATIONARY TOYS.

Chas. A. Kunou, Los Angeles, Calif.

These toys afford an opportunity for free design and conventionalization and are of interest to children in the fifth and sixth grades. They are best made of one-quarter inch soft wood, with bases built up of two one-quarter and one-half inch stock. They are to be painted in a two-tone or three-tone color scheme, using the dark shade for the lower part of the base and the eyes, mouth and gills; the medium shade for the upper base, the fins and the wave; and the tint for the body of the fish.

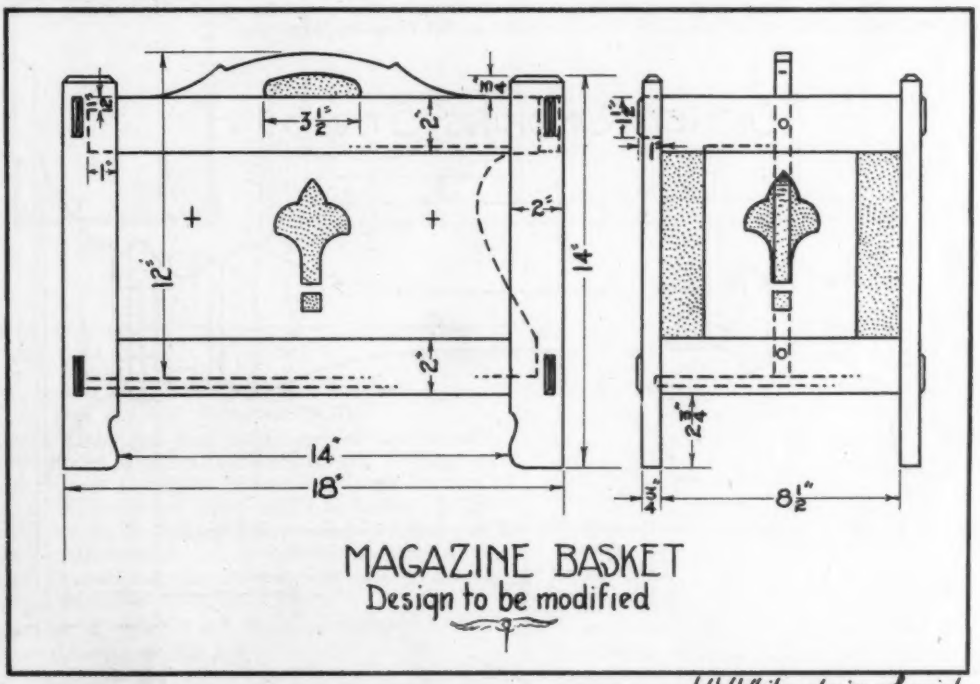
A BOOK RACK.

J. W. Heatley, Instructor, South Hills High School, Pittsburgh, Pa.

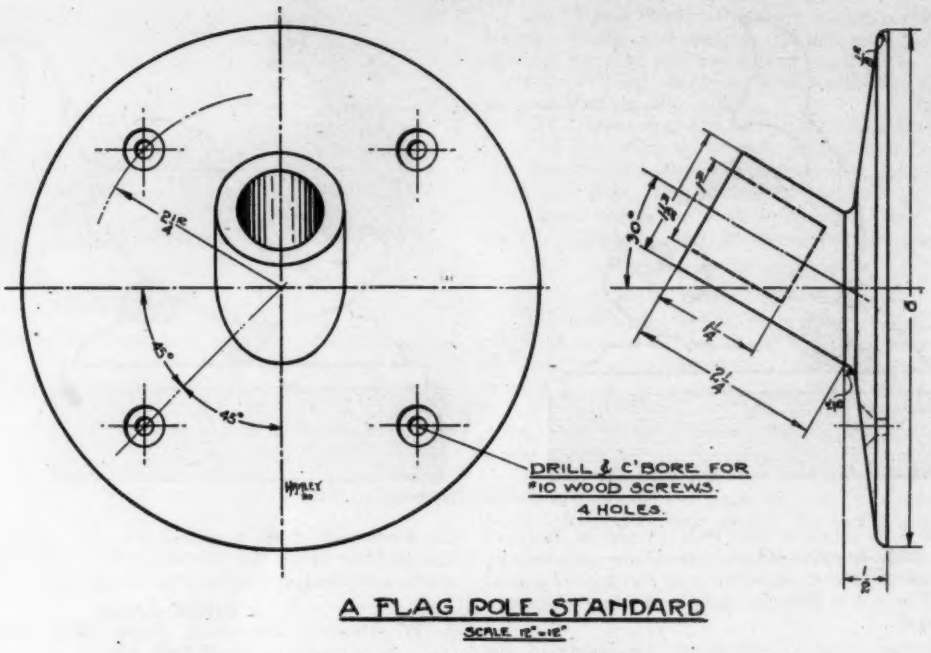
The high school student who is looking for a problem in woodwork that will make a valuable and very beautiful addition to his room and will offer an exercise that is within range of his ability, can make no better selection than a book rack so designed as to take care of the study wants of his busy school life.

This book rack provides compartments for mail, correspondence materials, books, pads, pencils, etc., each being accessible without interference with the other.

There are possibilities in design and proportion that the instructor might develop to fit the needs of the student. The construction involves some machine work and also the use of many of the woodworking tools common to the manual training equipment.



DETAILS OF MAGAZINE BASKET.



DETAILS OF A FLAG POLE STANDARD.

A FLAG POLE STANDARD.

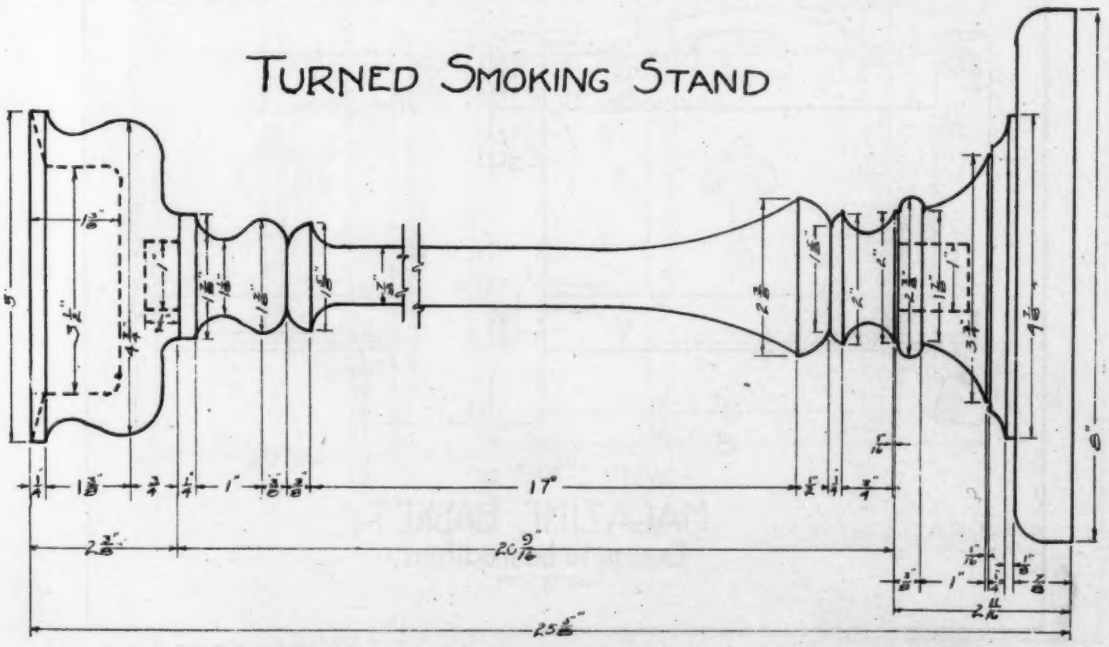
E. C. Hanley, Hackley Manual Training School, Muskegon, Mich.

The flag pole standard affords an excellent project for the pattern shop. The pattern should be constructed from two pieces of wood and after each has been worked to shape, doweled and glued together. The coreprint which projects at the end of the standard on the pattern should be of sufficient length to support the core rigidly in the mold as same is only supported at one end and has to lay in an angular position in the mold. In the mold the core may be held from floating upon the molten metal by inserting a thin wire nail at the end of the core which should project to a sufficient length to meet the sand in the "cope" and which forms the base of the casting. The countersinks for the screws should be constructed on the pattern so that they will appear on the casting thus saving the machinist the time and trouble of locating them later.

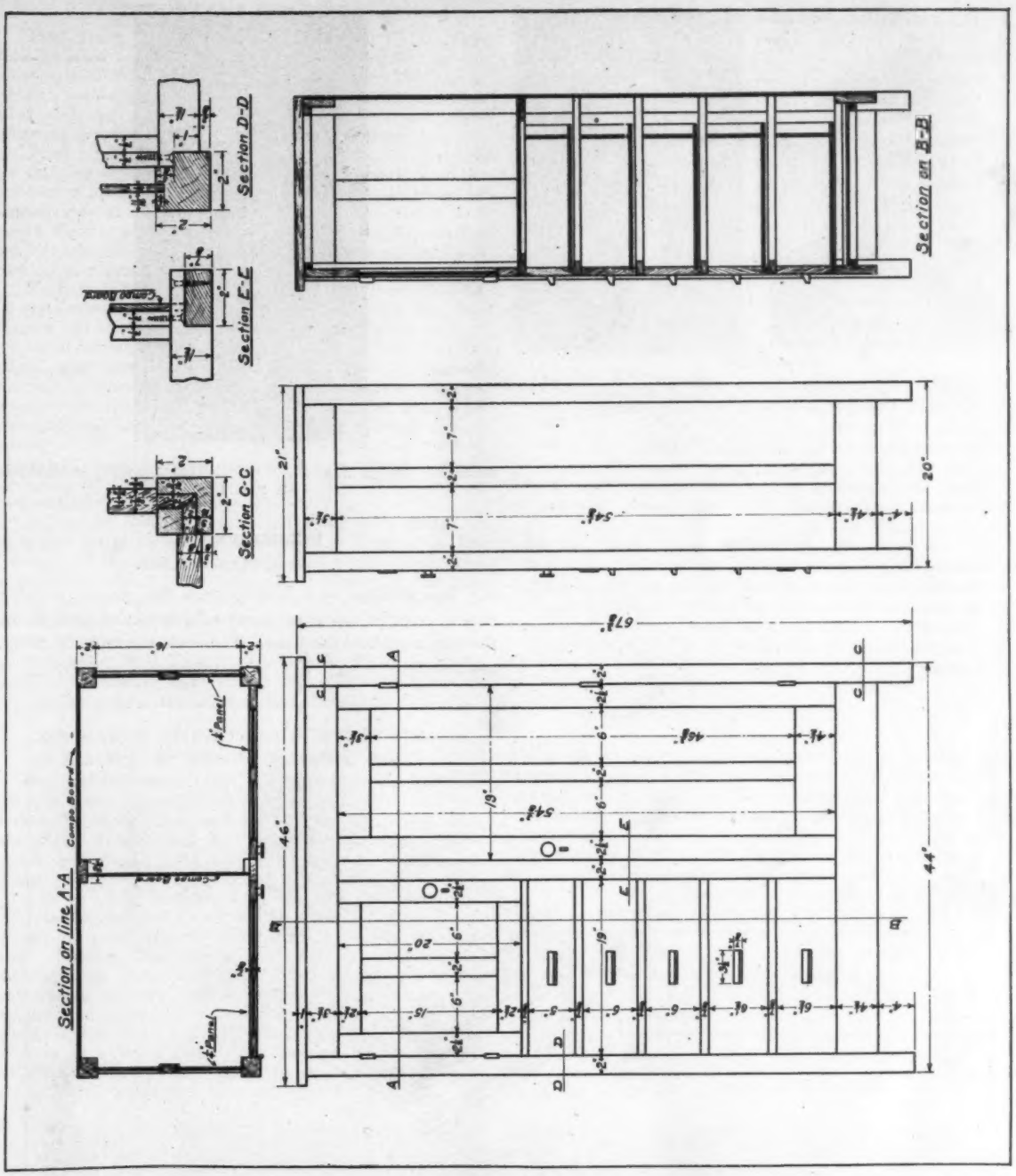
A SMOKING STAND.

James K. Shallenberger, Casper, Wyo.

The smoking stand illustrated on this page was designed and made in the shops of the Casper High School. In the case of the stand illustrated an old walnut table leg was used. The project involves practically all of the principles and processes of spindle turning and makes a useful piece of furniture.



DETAILS OF TURNED SMOKING STAND.



Details of Chifforobe.

A CHIFFOROBE.

Roy H. Neff, Bismarck, N. D.

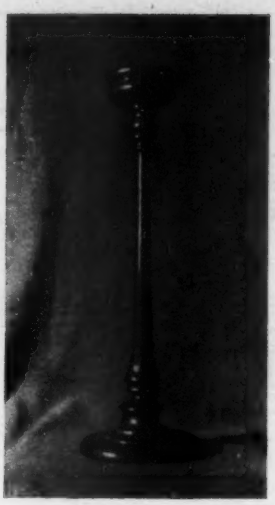
This chifforobe has been made successfully by advanced students of the Bismarck high school. It may be worked up in any acceptable cabinet wood and forms a useful piece of furniture for a man's bedroom. It is exceedingly simple in design and involves no unusual difficulties in construction. It is desirable that wood of good figure be used and that considerable care be taken in finishing to obtain an artistic effect.

The following mill bill will be found useful:

Mill Bill.

No.	Name.	Size.	Sq. In.
1	Top	1″x21″x46″	366
2	Top Frames	⅞″x ⅞″x40″	35
2	Top Side Frames	⅞″x ⅞″x16″	14
4	Legs	2″x 2″x66⅜″	133
2	Top Rails	⅞″x3½″x43″	151
2	Top Rails	⅞″x3½″x19″	67
2	Bottom Rails	⅞″x4½″x43″	194
2	Bottom Rails	⅞″x4½″x19″	86
4	Stiles—Side	⅞″x 2″x57⅜″	115
4	Panels—Side	¼″x7½″x54½″	406
2	Side Frames—Door	⅞″x2½″x55⅜″	139
1	Top Frame—Door	⅞″x3½″x17″	60
1	Bottom Frame—Door	⅞″x4½″x17″	77
2	Side Frames—Door	⅞″x2½″x20″	50

2	Top and Bottom Frames—Door	⅞″x2½″x17″	43
2	Panels—Door	¼″x6½″x47½″	309
2	Panels—Door	¼″x6½″x15½″	101
1	Drawer Front (top)	⅞″x 5″x19″	95
2	Drawer Fronts	⅞″x 6″x19″	114
2	Drawer Fronts	⅞″x6½″x19″	124
5	Drawer Rests	⅞″x1½″x21″	32
10	Drawer Rests	⅞″x1½″x17″	26
2	Floor Supports	⅞″x ⅞″x41½″	37
2	Floor Supports	⅞″x ⅞″x18″	16
	Compo Board.		
1	C. B. For Floor	18″x41½″	747
1	C. B. For Part	17⅞″x58⅞″	1052
2	C. B. For Rack	19½″x54⅞″	1070
	Bass Wood.		
2	Sides for Drawer	½″x 5″x16″	80
4	Sides for Drawers	½″x 6″x16″	96
4	Sides for Drawers	½″x6½″x16″	104
1	End for Drawer	¼″x 5″x18½″	93
2	Ends for Drawers	¼″x 6″x18½″	111
2	Ends for Drawers	¼″x6½″x18½″	147
5	Bottoms for Drawers	¼″x18½″x14½″	394
	Hardware.		
12	Screws	1½″	
6	Screws	1″	
3	Hinges	1″ x2″	
2	Hinges	1″ x2″	
2	Locks		
4	Casters		

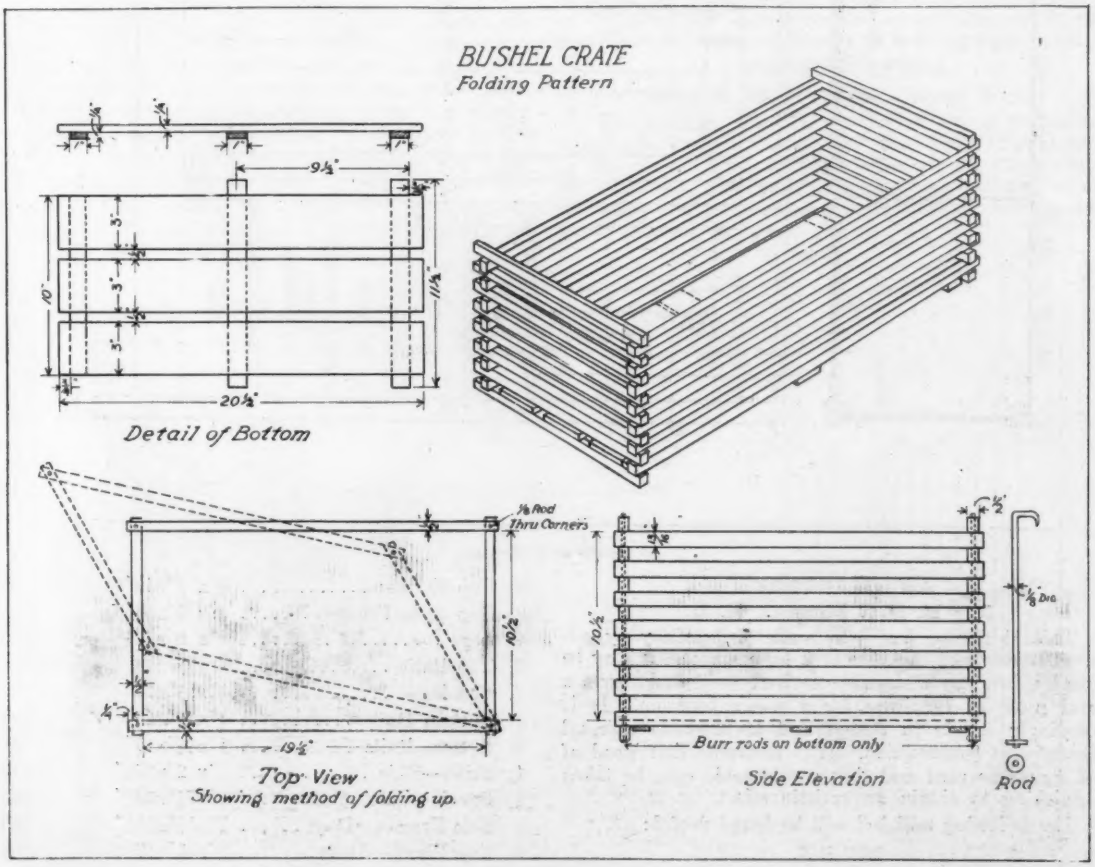


SMOKING STAND DESIGNED BY JAMES K. SHALLENBERGER.
See Page 412.

BUSHEL CRATE

J. I. Sowers, Vincennes, Ind.

The problem of a folding crate has proven popular among boys in the grades and affords useful exercise in the fundamental operations. The crate is useful for home gardeners.



DETAILS OF FOLDING VEGETABLE CRATE MADE IN THE VINCENNES, IND., SCHOOLS. J. I. SOWERS, SUPERVISOR.

IMPORTANT CHANGES.

Prof. Ira S. Griffith has succeeded Prof. F. D. Crawshaw as head of the manual training department at the University of Wisconsin. In his new position Prof. Griffith will have charge of the entire training of teachers for vocational and manual training schools, and will have under his direction the shops and special courses.

Prof. Griffith during the past two years, was head of the training department for vocational instructors of the University of Illinois, and before that was professor of manual arts at the University of Missouri. He is well known for his activities in the Western Arts Association and as author of a comprehensive series of books on wood working and carpentry.

Prof. Griffith's position at Illinois has been filled by the appointment of Mr. S. J. Vaughn of DeKalb, Ill. Mr. Vaughn has been for ten years head of the department of industrial education at the Northern Illinois State Normal School, and previous to that was supervisor of manual training in Illinois and Missouri. Mr. Vaughn has been prominently identified with the vocational and industrial education movement in the Middle West and has taken a leading part in the activities of the several manual arts and vocational education associations. During the war he was supervisor of technical instruction in the department of re-education at Fort McHenry, Md.

In his new position Prof. Vaughn will have charge of the entire activities of the University of Illinois, in the direction of training teachers for vocational, trade and continuation schools. In addition to classes at the university, he will establish centers for training teachers in various industrial communities of the state.

Mr. Fred D. Crawshaw, who resigned last spring from the University of Wisconsin, has become associated with the Illinois state agency for the New England Life Insurance Company. He is located at Peoria.

Prof. S. J. Vaughn,
University of Illinois,
Champaign, Ill.

Prof. Ira S. Griffith,
University of Wisconsin,
Madison, Wis.

AN EARLY CHRISTMAS SUGGESTION.

Elizabeth A. Boswell, Clarkdale, Ariz.

No doubt it seems ages till Christmas to you, but any way I am going to tell you about a plan that was carried out by the boys and girls in the Clarkdale, Arizona High School, and that worked out most happily for all concerned. This plan can easily be carried out by any school, for Clarkdale has no "copyright."

The children brought their old toys and discarded dolls and turned them over to the domestic science and manual training classes. The girls took the dolls in hand. They washed and painted their faces, made bewitching little frocks and caps for them and bound up their gaping wounds. The boys mended and painted the toys, making quite a few new ones such as doll ironing boards, chairs, beds, etc. By Christmas they had quite an array of new-old toys. You can see by the picture just what a crowd of boys and girls can accomplish when they all work together.

But the merriest time of all was when they had their Christmas tree and every little Mexican child in the school was presented with a toy or a doll. It is hard to tell who derived the most pleasure from this. The children who gave would probably tell you that it is more fun to give than to receive. The boys and girls who did the repair work no doubt enjoyed making useful, enjoyable, articles out of that which was useless, and the poor little children who thought that Santa was going to pass them by were happy, too.

Don't you really think that now would be a good time to lay aside old toys and dolls so that you can try this plan next Christmas?

A TEACHER'S THOUGHTS ON WAGES.

H. E. Stone, Erie, Pa.

I am in hearty favor of materially increasing the salaries of all teachers in Erie and everywhere. I do not believe, however, in the substitution of soviets for superintendents, in the relegation of school boards, and administrative officers to the position of clerks whose chief duty shall be to carry out the will of teachers regardless of the welfare of pupils.

I believe it the function of administrative specialists to hire teachers and to appraise their value. They alone are aware of the practical workings of the economic law of supply and demand as it affects the gaining, developing and retaining of efficient teachers.

I believe that boys and girls have a right to the best teachers the community can afford to pay for, and that administrative officers owe it to these same boys and girls and to their parents to eliminate the unfit whenever their places can be filled by the capable and progressive.

ARRAY OF TOYS MADE AND REPAIRED BY THE STUDENTS OF THE CLARKDALE, ARIZ., SCHOOL, FOR MEXICAN CHILDREN OF THE COMMUNITY.

I do not believe any school system can afford to drive personality and progress away by leveling salaries, establishing inflexible maxima, or failing to recognize individual differences among teachers as well as among pupils.

I, therefore, append the following for consideration by boards of education now besieged by taxpayers and teachers on the vital questions of school taxes and teachers' salaries:

How Much Wages!

Are you underpaid? Of course—in your own estimation. You have resorted to comparisons, haven't you? "There's John Smith, etc., etc." Perhaps you don't like him, anyway.

Stop!—Are you worth more? What have you done for self-improvement this year—this very month?

Look!—There is a man in your same line of work who works longer than you and who makes fewer mistakes. Do you admire him or are you jealous of him?

Listen!—Are you loyal? Can you be trusted? Do you boost or do you knock? How much are you worth to your employer? Do you care? Are you really interested in the success or failure of the business?

Prejudice, Bitterness, Disloyalty and Jealousy are efficiency killers. When were you killed? Who did it? The world pays little for dead ones.

Judgment, Sanity, Loyalty and Love are Life Savers. Who saved your life? How much has the rescue been worth to society?

Now project yourself. Imagine you're the engine. Do you keep on the track? What is your speed limit? Do you heed danger signals? How often are you laid up for repairs? Can you upgrade without puffing? How's your steam?

Say, fellow, have you ever stopped to look into your own worth in service to the community? Have you ever taken yourself into your mental round-house for a complete overhauling? You need not stop traffic to do it. Issue orders to yourself from headquarters and obey!

WILL MEET IN MINNEAPOLIS.

The Vocational Education Association of the Middle West will hold its next meeting in Minneapolis on February 10, 11, 12, 1921. The Curtis Hotel has been selected as headquarters. Ample space is assured for exhibits as well as for all the sessions.

This is the first meeting which this association has held outside of Chicago. In deciding to hold the meeting in Minneapolis and thus break from former procedure the board of directors were influenced by several motives and arguments among which are the following:

1. Hearty and generous invitations from the educational and civic interests of Minnesota and the northwest.
2. The proximity to the Canadian Northwest, where some interesting work is being done. A meeting in Minneapolis will make it possible for an interchange of ideas with teachers across the border.
3. The criticism that by meeting in Chicago the association was not meriting the use of the term "middle west."

EXHIBIT OF DRAWING, SEWING AND INDUSTRIAL WORK BY DEAF CHILDREN, ST. JOHN'S INSTITUTE, ST. FRANCIS, WIS.

4. The opportunity to study at first hand some of the excellent work which is being carried out in Minneapolis in vocational lines. This is an opportunity which will be welcomed by everyone interested in Vocational education.

The executive committee plans inaugurating a campaign which is hoped to result in a delegate sent from each community with expenses paid, to bring back the valuable results of the convention. It is believed that this is a valuable investment which every community should make for the good of its schools.

The president of the association is Edwin A. Lee, Indiana University, Bloomington, Indiana, and the secretary is Leonard W. Wahlstrom, 1711 Estes Ave., Chicago. Suggestions regarding the meeting may be sent to them and will be heartily welcomed.

VARIETY IN METHOD FOR VOCATIONAL AGRICULTURE.

The North Carolina director of vocational agriculture makes the following suggestions for introducing variety in method and sustaining interest:

Following are a few suggestions for introducing variety in our methods:

"1. Regular use of the farm papers. A number of the teachers plan for, at least part of a period each week, individual reports and discussion of articles of particular interest in the agricultural papers.

"2. Put on the blackboard or chart the weekly market reports. A graphic market chart of some of the important products of the community, plotted in each week, lends considerable interest to the market study.

"3. Let students report on new bulletins containing results of recent investigations.

"4. Organize debates on agricultural or rural community topics.

"5. Write letters, giving directions for the culture of some crop, care of stock, handy farm devices, etc.

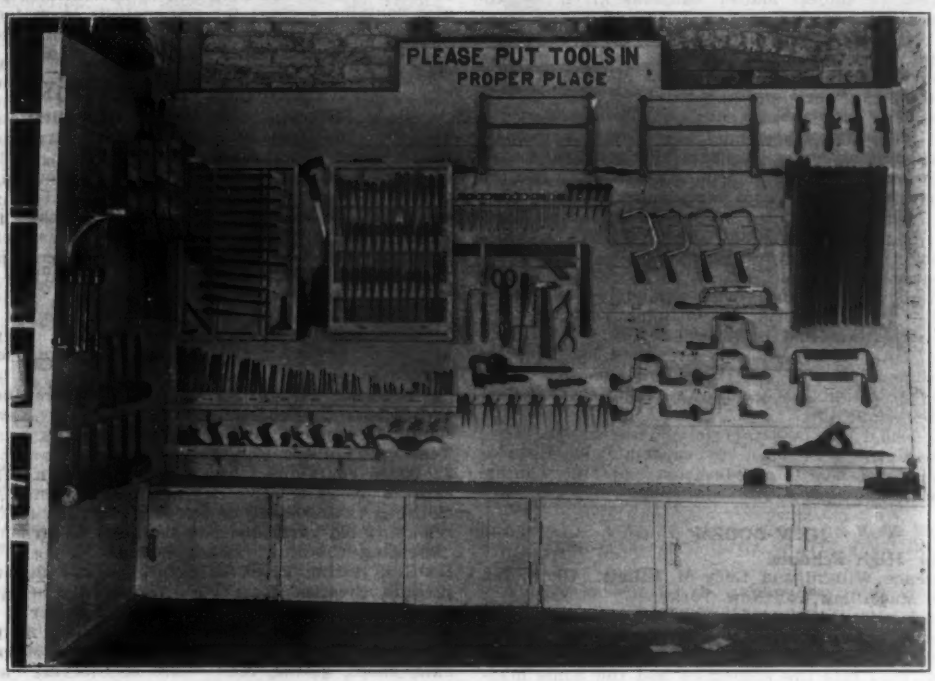
"6. Let students prepare talks for the agricultural club.

"7. Reports on the results of projects, giving interpretation of results, efficiency factors, things to do and not to do gained from their experience.

"8. Plan contests of various kinds.

"9. Teacher subordinate himself, and let a student plan and conduct a field trip on a subject of special interest to him.

"10. Socialize the method in the classroom."



GENERAL TOOL RACK. L. J. Mitten, Wilmette, Ill.

LUMBER RACK. L. J. Mitten, Wilmette, Ill.

AGRICULTURAL TEACHERS HOLD CONFERENCE.

A conference of teachers of agriculture in the state schools and in high school departments of agriculture, was held July 26-31, at the State College of Agriculture, Ithaca, N. Y. The conference was divided into committees according to subject matter and was given the cooperation of the University of New York and of the State College of Agriculture. Its purpose was the professional improvement of those engaged in the teaching of this subject and the working out of better methods in the organization of the work and the teaching methods.

The sessions which were devoted to the work of state school men, high school men, agricultural principals and to joint sessions for all teachers and principals, took up a study of horticulture, farm management, poultry work, gardening, concrete work, and short courses.

At the special conference for principals, held August 2-7, Mr. W. A. Holcomb, assistant director of the examination division of the New York Education Department, offered a course on "Essentials in the Organization and Administration of the Small High School." The course was intended for men serving jointly as principal and teacher of agriculture and comprised lectures, laboratory work and discussions of problems presented by the principals in connection with the topics. The subjects covered were organization, essentials of a recitation, standard tests, common faults in teaching methods, constructive supervision, school laws and reports, and school records.

The meetings were open to superintendents, principals, members of boards of education and others interested in vocational agricultural education.

NEW BOOKS

Dietetics for High Schools.

By Florence Willard and Lucy M. Gillett. Cloth, 202 pages. The Macmillan Co., New York.

This book offers an introductory course in the principles of nutrition as applied to family feeding. It emphasizes not only the need and value of practical, healthful diets but goes into the economies and the home management phases of selecting, buying, preparing and using food products. The treatment of the book is simple, but entirely scientific and pedagogic. Many valuable facts are presented in tabular and graphic form for quick reference and practical problems for experiment and home use are added to each chapter. The book will serve excellently for one-semester courses in high schools, or better, as an integral part of an intensive cooking course.

Animal Husbandry.

By John L. Tormey and Rolla C. Lawry. Cloth, 12mo, 352 pages. American Book Co., New York, Chicago, Boston.

This book will meet the needs of advanced boys' classes in vocational agriculture. It has been prepared from the standpoint of the practical stockman and is complete, but brief, in its treatment. It takes up the fundamental principles of feeding and caring for horses, cattle, sheep, swine, and poultry, and affords material for practical farm study and home projects.

The American Red Cross in the Great War.

Henry P. Davison. Cloth, octavo. 302 pages, illustrated. The Macmillan Co., New York.

Every American who is proud of our record during the great war must be equally proud of the achievements of our Red Cross. The present book which is now issued in a cheaper edition for schools and general readers, tells the story in a simple, straightforward manner, and is doubly impressive and interesting because of the author's modesty.

The Man of Tomorrow.

By Claude Richards. Cloth, 296 pages, illustrated. Thomas Y. Crowell Co., New York.

This book is a discussion of vocational success with the boy of today. It contains chapters on the need of vocational guidance, choosing a vocation, utilization of spare hours, factors of success, advice to the counselor, etc. It is a plea thruout for vocational guidance which, after all, is only "organized common sense used to help each individual to make the most of his abilities and opportunities." After preliminary chapters on "Choosing a Vocation," etc., the author passes on to a study of the vocations themselves, and discusses callings and trades from agriculture to the fine arts, pointing out the strong features of each, and a boy's chances for success therein. A special plea is made for thoro training and a complete education, no matter what line the boy intends to follow. He shows that the boy who leaves school at an early age may get a certain time advantage over his mate, but the latter if properly equipped, will easily outstrip him.

The book is well illustrated with pictures showing boys at work both in the shop and in agricultural pursuits. It also contains a chart for self-analysis in major characteristics, a list of 64 questions to be answered in self-analysis, and a tabular analysis of himself in choosing a vocation, etc.

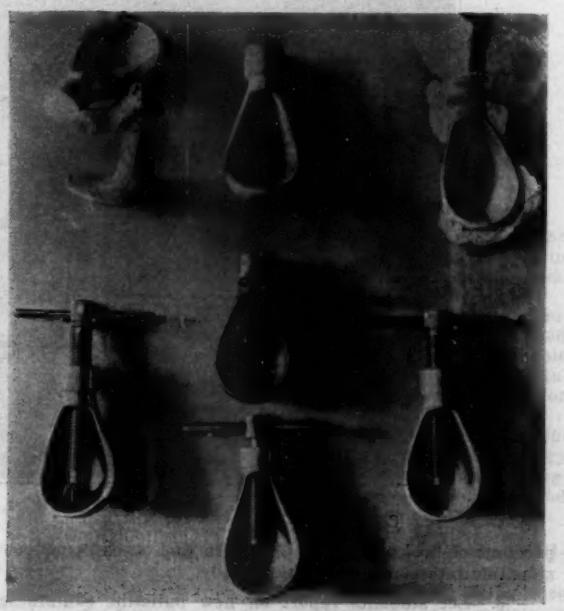
OFFICIAL PUBLICATIONS.

Farm Gardening. Vocational Rehabilitation Series No. 44, 1920. Prepared by Walter J. Quick, training officer of the department of agricultural education, Federal Board of Vocational Education. This pamphlet has been included in the list of rehabilitation literature as a result of the interest awakened in the subject in the expeditionary forces and its effect in America. It was found that it filled an important place in the convalescent hospitals in providing healthful occupation and insuring a constant supply of fresh vegetables for table use. The pamphlet takes up a study of home gardening, market gardening, land equipment, farm gardening, rotation of crops, draining, seed gardening, and organization among farmers and gardeners.

Selection and Care of Clothing, Farmers' Bulletin 1089, United States Department of Agriculture, by Laura I. Baldt, Instructor, Department of Textiles and Clothing, Teachers' College, Columbia University, is a pamphlet of 32 pages containing articles on "Thrift in selection and care of clothing", which includes a spending plan for clothing, taking stock of left-over clothing, freshening and remaking old garments, and listing new garments needed; "Choosing Clothing" which includes general facts about textiles, testing goods with the eye and fingers, burning threads, chemical tests, etc.; "Suitability of Material, Design, and Color", suiting design and material to the figure, colors to the wearer, harmonizing material, good fitting, finishes and trimmings, underwear, outer garments, hats, shoes, gloves, etc.; "Care of Clothing" and articles needed for same. It is a very instructive pamphlet which any girl can use to advantage.

Suggestions for Teaching Manual Arts. Prepared by Hans W. Schmidt, Supervisor of Manual Arts, State Department of Public Instruction, Madison, Wis. Contains some suggestions for shop courses and manual arts work in general, for use in the seventh to the tenth grades.

Rehabilitation of Disabled Soldiers. Report No. 1194 of the Committee on Education to the House of Repre-



STEPS IN THE MANUFACTURE OF A NUT CRACKER FROM THE ROUGH CASTING TO THE FINISHED PRODUCT. MADE IN THE A. & M. COLLEGE SHOPS, STILLWATER, OKLA.

sentatives of the United States. The report which was presented June 4, 1920, constituted the findings of the committee in the investigation of the rehabilitation work of the Federal Board of Vocational Education.

Report of Trade and Industrial Education, Raleigh, N. C., for the year 1919-20. T. E. Browne, Director of Vocational Education. The pamphlet contains the report of the state supervisor of trade and industrial education and the report of the teacher-trainer in trades and industries. The work of the past year was very successful and the indications are that the next year will witness a much greater demand for vocational classes.

The Fiftieth Annual Report of the Metropolitan Museum, of New York, for the year 1919. The annual report of the museum is the only means of communication between the trustees and the members and contains a detailed account of the activities of the year as well as a full description of the important accessions. The salient points in the report for the past year are an estimated increase of more than 244,000 in attendance, a demonstrat'on of the desirability of adding music of a high order to the other attractions of the Museum, and important additions to the art collections in the form of etchings and woodcuts, Egyptian statues, gilded armor, portraits and tapestries. The museum reports that its total accessions in art objects reached 1,394, or an increase of 444 over those of the former year. They include bequests, gifts and purchases, of which the gifts alone in number and monetary value assume some importance.

The Lunch Hour at School. Katherine A. Fisher. Health Bulletin No. 7, 1920, Bureau of Education, U. S. Department of the Interior. The campaign for child health has given a new impetus to the school-lunch movement in America. Teachers are beginning to regard the school lunch as a health project which should be given an important place in the curriculum. This presentation of the organization of school lunches is recommended to teachers and others working in the interest of child health. It discusses the problem of school lunches in elementary schools, rural schools, high and normal schools, lunch-room stands, labor problem, accounting, and relations to the home economics department.

A Comparison of Mechanical Features and Operating Principles of Farm Lighting Sets. Prepared by P. H. Daggett and W. C. Walke of the North Carolina Highway Commission, in collaboration with the Bureau of Extension of the University. Issued by the University of North Carolina at Chapel Hill. This represents the second of a series of six leaflets intended to furnish information on electric light and power, water supply, sanitation and telephones for people who live in country communities. The present pamphlet is to be used as a simple and concise guide for those who contemplate the buying of a farm-lighting set. It discusses in detail direct and belted types of lighting plants, air cooling, fundamental processes in a gas-engine cylinder, automatic switches, carburetors, fuel supply for lighting plants, governors, storage batteries, ignition and battery capacities.

A PROGRAM FOR ROCKFORD.

Mr. Thomas Bjorge, director of industrial education, has outlined the following program in prevocational work for the junior high schools of Rockford, Ill.:

The junior high school should embrace the seventh, eighth, and ninth grades, with the *prevocational idea predominating*, including an acquaintance course of from one to two hours per day in as many different occupations (typical to the community) as possible: forging, founding, pattern making, cabinet making, machine shop, electrical construction, sheet-metal, printing, plumbing, concrete construction, automobile mechanic, carpentry, debating, bookkeeping, typewriting, salesmanship, art-design, free-hand drawing of machine elements, mechanical drawing.

The shop work should deal with as many of the typically fundamental shop operations as time will permit, carefully analyzed, and arranged in the best teaching order, Problem projects, whenever practicable, should be such as to be of use to the boy or the school when finished.

The prevocational shopwork should be given primarily for its vocational guidance effect, therefore, it should be the purpose of each shop to give to every boy as complete a fund of vocational guidance information as possible:

PRODUCTS OF A NIGHT-SCHOOL CLASS IN REED WORK, FORT DODGE, IA. MISS EMMA G. KITT, DIRECTOR.

1. Comparison of the occupation with other occupations in the same organization.

2. Rank of occupation, in wealth, numbers, etc.—Printing ranks sixth.

3. Hygiene and dangers of occupation.

4. Remuneration and possibilities for advancement.

5. Entrance upon an occupation, rules and laws relating to apprenticeship.

6. What is the demand for labor and the supply?

7. Personal qualifications tests: health, size, eyesight, hearing, aptitude, willingness, cheerfulness, personality.

ART TEACHERS NEEDED.

Examinations for license as teacher of freehand drawing in high schools will be conducted by the New York City board of examiners at the Board of Education, Park Avenue and Fifty-ninth Street, on Sept. 20 and 21.

Teachers of drawing in the high schools are appointed from eligible lists of persons who have passed the tests required by the board of examiners. Both men and women are eligible.

The high schools employ over one hundred teachers of drawing, and there is at present a considerable number of vacancies. Candidates who receive good ratings upon the examinations may expect early appointment to well paid and permanent positions.

The examination is given on two successive days, and those successful in passing the written and drawing (practical) tests, are later examined orally in a teaching test given before a class. Candidates coming from a distance can arrange to have their oral tests given the day following the written examination.

Under the new salary schedules the minimum salary of an assistant drawing teacher is $1,000 per annum, the maximum $3,700, for the thirteenth and subsequent years of satisfactory service.

INCREASE ANNOUNCED.

With considerable reluctance the publisher announces an increase in the subscription price of the INDUSTRIAL ARTS MAGAZINE to $2.50 per year. During the past year the cost of paper, printing and all other elements entering into the manufacture of the magazine have risen—in some cases doubled.

NOW, ARE THERE ANY QUESTIONS?

This department is intended for subscribers who have problems which trouble them. The editors will reply to questions, which they feel they can answer, and to other questions they will obtain replies from competent authorities. Letters must invariably be signed with full name of inquirer. All questions are numbered in the order of their receipt. If an answer is desired by mail, a stamped envelope should be enclosed. The privilege of printing any reply is reserved. Address, Industrial-Arts Magazine, Milwaukee, Wis.

Finish for Mahogany and Black Walnut.

100. Q:—1. What is the best method of finishing mahogany? 2. How can I get a wonderful gloss on mahogany? 3. Does mahogany need a filler? 4. How should black walnut be finished, in the natural color, but with a high gloss?—*E. R.*

A:—1. With the general run of mahogany on the market under which name Spanish Cedar, Baywood of a light pinkish color to the rich red color of Cuban and African mahogany, any or all of which may be included in the same shipment—under these conditions then I doubt very much the advisability of attempting to finish a piece of cabinet work without a stain coat to produce an evenness of shade as well as to accent the natural features of the grain. Unstained mahogany, especially of the poorer grades has a very anaemic look when finished without any stain. However, the best method which can be applied is as follows: Sponge the wood thoroly with clean water which has been drawn from the faucet after running the water for some time. This is necessary in order that the water may contain as little iron salts as possible, which in contact with mahogany cause blackish streaks. After the work has thoroly dried, sand perfectly smooth, dust off and give a coat of white shellac, reduced with denatured alcohol to the consistency of water. This should be used simply as a sizing coat to prevent the penetration of varnish and consequent absorption of the oil. When the shellac is hard, sand clean and smooth with a split 0000 sandpaper, then prepare a filler made from silex and tinted with Rose Lake, Sienna and Van Dyke brown to exactly match the shade of the mahogany. Apply this filler being careful to rub it in thoroly and clean off properly. Let harden 48 hours and then brush on a thin coat of Keystone Co. DeGrah varnish and let harden three days. Sand this coat, apply another and repeat up to four coats; the third and fourth should be rubbed out with pumice stone, felt pad and water and the last coat polished with a good polish and left in a medium gloss.

2. It is not quite clear what is meant by this question, as it admits of two interpretations. The first is provided the furniture is already varnished and has received enough coats to produce a true, even surface for the last, it should then be rubbed with a felt pad, rotten stone and water until the entire surface is thoroly polished. It should then be cleaned off with a soft sponge and plenty of water and then brought to a hard, bright surface with a suitable polish. The second interpretation is answered by suggesting that filling and at least four coats of varnish, the first two carefully sanded, the last two rubbed out and polished as suggested in the previous answers, are necessary to produce a high gloss on mahogany.

3. Mahogany should always be filled because it belongs to the open poured group of woods but more particularly because a filler is necessary in order that the pores may be properly leveled up as a true foundation for the four or more coats of varnish which should be used on mahogany. This wood does not show to its best advantage except under a semi-gloss or full gloss finish.

4. Exactly the same as in the method for mahogany in question No. 1, with the exception of the colors for the filler which should be Van Dyke Brown, drop black and burnt umber, omitting the red pigments of Sienna and Rose Lake. To obtain the high gloss on black walnut, three or four coats are necessary for the varnish and the last coat should be polished with rotten stone, felt pad and water, washed clean and polished with a good furniture polish. To obtain the so-called satin finish, the last coat of varnish is rubbed with F pumice stone flour, felt pad and water, cleaned up and oiled off with a good furniture polish.—*Ralph G. Waring.*

Shop Mathematics.

101. Q:—As director of mechanic arts for the city I am looking for a suitable text for a shop-mathematics course. Can you tell me what is best?—*A. B. H.*

A:—The following textbooks are used for reference and classwork in shop mathematics: *Shop Mathematics*, Norris & Smith, $1.50, McGraw-Hill Book Co., N. Y.; *Constructive Textbook of Practical Mathematics*, Marsh, John Wiley & Sons, N. Y.; *Mathematics for Machinists*, Burnham, $1.25, John Wiley & Sons, N. Y.; *Practical Applied Mathematics*, Hale, $1.00, John Wiley & Sons, N. Y.; *Practical shop Mechanics & Mathematics*, Johnson, $1.00, John Wiley & Sons, N. Y.; *Machine Shop Arithmetic*, Colvin & Cheney, $0.50, N. W. Henley Pub. Co., N. Y.; *Shop Problems in Mathematics*, Breckenridge, Mesereau & Moore, $1.00, Ginn & Co., Chicago; *Shop Mathematics*, Edward E. Holton, Taylor-Holden Co., Springfield, Mass.

Farm Carpentry Books.

102. Q:—Can you tell me of some good books on farm carpentry, such as erection of buildings, etc.?—*C. W. S.*

A:—*Lee's Poultry House Construction*, Farmers' Bulletin No. 574, 1914, U. S. Department of Agriculture, Washington, $0.50; *Powell's Barn Plans and Outbuildings*, $1, Manual Arts Press, Peoria, Ill.; *Frudden's Farm Buildings—How to Build Them*, $1, Wm. T. Comstock Co., New York; *Hopkins' Modern Farm Buildings*, $3, Webb Publishing Co., St. Paul, Minn.; *Radford's Practical Country Buildings*, Northern Hemlock & Hardwood Manufacturers' Association, Wausau, Wis.; *Farm Buildings*, $2, Manual Arts Press, Peoria; *Blackburn's Problems in Farm Woodwork*, Manual Arts Press; *Brace and Mayne's Farm Shopwork*, $1, American Book Co., New York; *Roehl's Agricultural Woodworking*, $1, Bruce Publishing Company; *Roehl's Farm Woodwork*, $1.25, Bruce Publishing Company.

OFFICERS WANTED FOR REHABILITATION DIVISION OF THE FEDERAL BOARD FOR VOCATIONAL EDUCATION.

The United States Civil Service Commission will hold competitive examinations for the positions of training officer, training assistant, placement officer, placement assistant, district medical officer and assistant medical officer, in the Rehabilitation Division of the Federal Board for Vocational Education, for duty in the field or in Washington, D. C. Competitors will be rated on the basis of education 25, experience 50, and thesis and publications to be filed with application 25. Under the first two subjects competitors will be rated upon the sworn statements in their applications and upon corroborative evidence.

For the positions of district medical officer and assistant, applicants must have reached their twenty-fifth but not their sixty-fifth birthday, and for the other positions their twenty-fourth but not their fiftieth birthday on the date of making oath to the application. Age limits do not apply to persons entitled to preference because of military or naval service. Employes in these positions who have reached their seventieth birthday, and have served fifteen years, will be entitled to retirement and annuity. Applicants who fail to attain a rating of at least 70 per cent in the third subject, "Thesis and publications," will not be eligible for appointment. They must be actual residents of the state or territory for at least one year previous to the examination. Applications will be received until further notice. In making application write for Form 2118, stating title of examination desired, to the following: Civil Service Commission, Washington, D. C.; Secretary of the United States Civil Service Board, Customhouse, Boston, New York, New Orleans, Honolulu, Hawaii; Post Office, Philadelphia, Atlanta, Cincinnati, Chicago, St. Paul, Seattle, San Francisco; Old Customhouse, St. Louis; Administration Bldg., Balboa Heights, Canal Zone; or to the Chairman of the Porto Rican Civil Service Commission, San Juan, P. R.

Salaries for the several positions vary from $1,500 to $3,000 a year.

Arthur E. Holder has been reappointed for a term of three years as member of the Federal Board for Vocational Education.

Mr. R. E. Fisher has been appointed Chief of the Division of the Rehabilitation of the Federal Board of Vocational Education. He succeeds Mr. Uel W. Lambkin.